



# Production program / Linecard Thin film (Metal film)

Thin film series								CMF
		Precision application		Professional application				
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	U <sub>max</sub> (V)	P <sub>70</sub> <sup>(3)</sup> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CMF	0402	12,50	0,016	50	0,063	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 <sup>(5)</sup>
						100R – 221k	0,1 / 0,25 / 0,5 / 1	25
						100R – 511k	0,1 / 0,25 / 0,5 / 1	50
						10R0 – 1M00	1	50
CMF	0603	25,00	0,032	75	0,100	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>
						10R0 – 511k <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 1M50 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	0805	35,00	0,050	150	0,125	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>
						10R0 – 1M00 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 2M00 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1206	50,00	0,100	200	0,250	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>
						35R0 – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	15
						10R0 – 2M00 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 4M70 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1210	50,00	0,100	200	0,500	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>
CMF	2010	100,00	0,150	300	0,500	10R0 – 2M00 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25
CMF	2512	100,00	0,250	500	1,000	10R0 – 4M70 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1218	50,00	0,300	200	1,000	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>

<sup>1)</sup> 10R – 100R from ± 0,1% tolerance    <sup>2)</sup> 1R – 10R from ± 0,5% tolerance    <sup>3)</sup> TCR ± 5 on request    <sup>4)</sup> TCR ± 5 on request    <sup>5)</sup> TCR ± 10 on request  
<sup>3)</sup> For continuous operation sufficient heat dissipation must be ensured.

Contact variants available for all types	Sign	Characteristics
Lead-free standard contact	CMF	Electroplated pure tin contact
Epoxy bondable contact	CMF-K	Tin-free contact for mounting with conductive adhesive
Non magnetic contact	CMF-N	Without electroplated Ni-Barrier (low rest permeability), suitable only for reflow soldering method

Ordering information								
CMF	- N	0603	10k	0,1%	10ppm/K	K	P	5 (optional)
Typ	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMF	Standard (without add.) -N (non magnetic) -K (epoxy bond.)	0402 to 2512	1R to 4M7	0,05 0,1 0,25 0,5 1	10 15 25 50	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

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Thin film series – Power variant							CMP
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> <sup>(3)</sup> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
CMP	0402	50	0,100	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 <sup>(5)</sup>	
				100R – 221k	0,1 / 0,25 / 0,5 / 1	25	
				100R – 511k	0,1 / 0,25 / 0,5 / 1	50	
				10R0 – 1M00	1	50	
CMP	0603	75	0,125	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>	
				10R0 – 511k <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25	
				1R00 – 1M50 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50	
CMP	0805	150	0,200	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>	
				10R0 – 1M00 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25	
				1R00 – 2M00 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50	
CMP	1206	200	0,400	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 <sup>(4)</sup>	
				10R0 – 2M00 <sup>(1)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	25	
				1R00 – 4M70 <sup>(1)(2)</sup>	0,05 / 0,1 / 0,25 / 0,5 / 1	50	

<sup>1)</sup> 10R – 100R from ± 0,1% tolerance    <sup>2)</sup> 1R – 10R from ± 0,5% tolerance    <sup>3)</sup> TCR ± 5 on request    <sup>4)</sup> TCR ± 5 on request    <sup>5)</sup> TCR ± 10 on request  
<sup>3)</sup> For continuous operation sufficient heat dissipation must be ensured.

Voltage proof thin film series							CMV
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
CMV	1206	300	0,250	100k – 4M70	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 25 / 50	
CMV	2512	1000	1,000	100k – 4M70	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 25 / 50	

Networks with circuit variants							CMA
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range with circuit variants (R1=R2=R3=R4 / R1=R4 ; R2=R3)	R-Tolerance (± %)	TCR (± ppm/K)	
CMA	1206-4	50	0,063 per element	100R – 25k	0,25 / 0,5 / 1	25 / 50	

Jumper in thin film technology		Jumper / SMD-Bridge 0R
For all sizes we offer jumpers (0R).		max. 0R020

Platinum-Chip-Temperature sensors					CPT
Type	Size	R-Range	Class	TCR (ppm/K)	
CPT	0805 / 1206	100R, 500R, 1k (other values on request)	F0,1; F0,15; F0,3	3850	



# Production program / Linecard

## Thick film

Thick film series - Standard						CDF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> <sup>(1)</sup> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CDF	0402	50	0,063	1R – 10M	1	50 / 100
CDF	0603	75	0,100	1R – 10M	0,5 / 1	50 / 100
CDF	0805	150	0,125	1R – 10M	0,5 / 1	50 / 100
CDF	1206	200	0,250	1R – 10M	0,5 / 1	50 / 100

Thick film series - Power variant						CDP
CDP	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CDP	0402	50	0,100	1R – 10M	1	50 / 100
CDP	0603	75	0,125	1R – 10M	0,5 / 1	50 / 100
CDP	0805	150	0,200	1R – 10M	0,5 / 1	50 / 100
CDP	1206	200	0,400	1R – 10M	0,5 / 1	50 / 100

High power series						CLF
CLF	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CLF	1210	200	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	1218	200	1,000	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	2010	300	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	2512	500	1,000	1R – 10M	0,5 / 1 / 5	50 / 100

Low ohmic series						CNF
CNF	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CNF	0402	$U = \sqrt{P \cdot R}$	0,063	0R27 – 0R99	1 / 5 / 10	100
CNF	0603		0,100	0R05 – 0R27 0R27 – 0R99	5 / 10 1 / 5 / 10	500 100
CNF	0805		0,125			
CNF	1206		0,250			
CNF	1210		0,500			
CNF	2010		0,500			
CNF	2512		1,000			
CNF	1218	1,000	0R02 – 0R10 0R10 – 0R99	5 / 10 1 / 5 / 10	500 100	

High ohmic series						CHF
CHF	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
CHF	0402	50	$P = \frac{U^2}{R}$	>10M – 1G <sup>(2)</sup>	from 1,0 (>330M from 5,0%)	100 / 250 (>500M TCR 500)
CHF	0603	75		>10M – 1G <sup>(2)</sup>		
CHF	0805	150		>10M – 1G <sup>(2)</sup>		
CHF	1206 / 1210 / 1218	200		>10M – 1G <sup>(2)</sup>		
CHF	2010	300		>10M – 1G <sup>(2)</sup>		
CHF	2512	500		>10M – 1G <sup>(2)</sup>		



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Trimmable series						CRA	CQA
Trimmable series with better visual recognition							
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TC (± ppm/K)	
CRA / CQA	0402	50	0,063	1R – 10M <sup>(3)</sup>	Tolerance acc. customer request up to ±30% (also variable)	50 / 100	
CRA / CQA	0603	75	0,100	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	0805	150	0,125	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	1206	200	0,250	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	1210	200	0,500	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	1218	200	1,000	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	2010	300	0,500	1R – 10M <sup>(3)</sup>		50 / 100	
CRA / CQA	2512	500	1,000	1R – 10M <sup>(3)</sup>		50 / 100	

<sup>3)</sup> For CQA only 1R – 100R

Pulse proof series						CDI / CLI
CDI / CLI	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TC (± ppm/K)
CDI	0402	50	0,063	1R – 10M	5 / 10 / 20	50 / 100
CDI	0603	75	0,100	1R – 10M	5 / 10 / 20	50 / 100
CDI	0805	150	0,125	1R – 10M	5 / 10 / 20	50 / 100
CDI	1206	200	0,250	1R – 10M	5 / 10 / 20	50 / 100
CLI	1210	200	0,500	1R – 10M	5 / 10 / 20	50 / 100
CLI	1218	200	1,000	1R – 10M	5 / 10 / 20	50 / 100
CLI	2010	300	0,500	1R – 10M	5 / 10 / 20	50 / 100
CLI	2512	500	1,000	1R – 10M	5 / 10 / 20	50 / 100

Networks						CNR
CNR	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TC (± ppm/K)
CNR	1206-4	50	0,063 per element	10R – 1M	1 / 5	50 / 100

Jumper in thick film technology		Jumper
For all sizes we offer jumpers (0R).		max. 0R020

Contact variants available for all types	Sign (e.g. for CDF)	Characteristics
Lead-free standard contact	CDF	Electroplated pure tin contact
Epoxy bondable contact	CDF-K	Tin-free sputtered contact for mounting with conductive adhesive
Non magnetic contact	CDF-N	Contact without electroplated Ni-Barrier (low rest permeability), suitable only for reflow soldering method
Corrosive gas resistant	CDF-S	Increased resistance against sulfonamide processes

<sup>1)</sup> For continuous operation sufficient heat dissipation must be ensured.

<sup>2)</sup> Higher R-Values on request



# Production program / Linecard

Thin film (Metal film) - Automotive variant (AEC Q200 qualified)

Thin film series - Automotive variant							AMF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
AMF	0603	75	0,100	100R – 56k	0,1 / 0,25 / 0,5 / 1	10 / 15 25 50	
AMF	0805	150	0,125	100R – 130k	0,1 / 0,25 / 0,5 / 1	10 / 15 25 50	
AMF	1206	200	0,250	100R – 180k	0,1 / 0,25 / 0,5 / 1	10 / 15 25 50	

Networks with circuit variants							AMA
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range with circuit variants (R1=R2=R3=R4 / R1=R4 ; R2=R3)	R-Tolerance (± %)	TCR (± ppm/K)	
AMA	1206-4	50	0,063 per element	100R – 25k	0,25 / 0,5 / 1	25 / 50	

Jumper in thin film technology		Jumper / SMD-Bridge 0R
For sizes 0603, 0805, 1206 we offer jumpers (0R).		max. 0R020

Contact variants available for all types	Sign	Characteristics
Lead-free standard contact	AMF	Electroplated pure tin contact

Ordering information								
AMF		0603	10k	0,1%	10ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
AMF	Standard (without add.)	0603 to 1206	100R to 180K	0,1 0,25 0,5 1	10 15 25 50	K- with N- without	P- Card tape S- Bulk	Depends on size and packaging unit

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Thick film series - Standard							ADF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> <sup>1)</sup> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
ADF	0402	50	0,063	1R – 10M	1	50 / 100	
ADF	0603	75	0,100	1R – 10M	0,5 / 1	50 / 100	
ADF	0805	150	0,125	1R – 10M	0,5 / 1	50 / 100	
ADF	1206	200	0,250	1R – 10M	0,5 / 1	50 / 100	

High power series							ALF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
ALF	1210	200	0,500	1R – 10M	0,5 / 1 / 5	50 / 100	
ALF	1218	200	1,000	1R – 10M	0,5 / 1 / 5	50 / 100	
ALF	2010	300	0,500	1R – 10M	0,5 / 1 / 5	50 / 100	
ALF	2512	500	1,000	1R – 10M	0,5 / 1 / 5	50 / 100	

Low ohmic series							ANF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
ANF	0402	U = √P*R	0,063	0R27 – 0R99	1 / 5 / 10	100	
ANF	0603		0,100	0R05 – 0R27 0R27 – 0R99	5 / 10 1 / 5 / 10	500 100	
ANF	0805		0,125				
ANF	1206		0,250				
ANF	1210		0,500				
ANF	2010		0,500				
ANF	2512		1,000	0R02 – 0R10 0R10 – 0R99	5 / 10 1 / 5 / 10	500 100	
ANF	1218	1,000					

High ohmic series							AHF
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	
AHF	0402	50	P = U <sup>2</sup> / R	>10M – 1G <sup>2)</sup>	from 1,0 (>330M from 5,0%)	100 / 250 (>500M TK 500)	
AHF	0603	75		>10M – 1G <sup>2)</sup>			
AHF	0805	150		>10M – 1G <sup>2)</sup>			
AHF	1206 / 1210 / 1218	200		>10M – 1G <sup>2)</sup>			
AHF	2010	300		>10M – 1G <sup>2)</sup>			
AHF	2512	500		>10M – 1G <sup>2)</sup>			

<sup>1)</sup> For continuous operation sufficient heat dissipation must be ensured.  
<sup>2)</sup> Higher R-Values on request

Trimable series						ARA
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
ARA	0402	50	0,063	1R – 10M	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
ARA	0603	75	0,100	1R – 10M		50 / 100
ARA	0805	150	0,125	1R – 10M		50 / 100
ARA	1206	200	0,250	1R – 10M		50 / 100
ARA	1210	200	0,500	1R – 10M		50 / 100
ARA	1218	200	1,000	1R – 10M		50 / 100
ARA	2010	300	0,500	1R – 10M		50 / 100
ARA	2512	500	1,000	1R – 10M		50 / 100

Networks						ANR
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
ANR	1206-4	50	0,063 per element	10R – 1M	1 / 5	50 / 100

Jumper in thick film technology		Jumper
For all sizes we offer jumpers (0R).		max. 0R020

Trimable series with better visual recognition						AQA
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
AQA	0402	50	0,063	1R – 100R	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
AQA	0603	75	0,100	1R – 100R		50 / 100
AQA	0805	150	0,125	1R – 100R		50 / 100
AQA	1206	200	0,250	1R – 100R		50 / 100
AQA	1210	200	0,500	1R – 100R		50 / 100
AQA	1218	200	1,000	1R – 100R		50 / 100
AQA	2010	300	0,500	1R – 100R		50 / 100
AQA	2512	500	1,000	1R – 100R		50 / 100

Contact variants	Sign (e.g. for ADF)	Characteristics
Lead-free standard contact	ADF	Electroplated pure tin contact

Ordering information								
ADF		0603	10k	1%	50ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ADF	Standard (without add.)	0402 . . 2512	1R to 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Pulse proof series						ADI / ALI
Type	Size	U <sub>max</sub> (V)	P <sub>70</sub> (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)
ADI	0402	50	0,063	1R – 10M	5 / 10 / 20	50 / 100
ADI	0603	75	0,100	1R – 10M	5 / 10 / 20	50 / 100
ADI	0805	150	0,125	1R – 10M	5 / 10 / 20	50 / 100
ADI	1206	200	0,250	1R – 10M	5 / 10 / 20	50 / 100
ALI	1210	200	0,500	1R – 10M	5 / 10 / 20	50 / 100
ALI	1218	200	1,000	1R – 10M	5 / 10 / 20	50 / 100
ALI	2010	300	0,500	1R – 10M	5 / 10 / 20	50 / 100
ALI	2512	500	1,000	1R – 10M	5 / 10 / 20	50 / 100