



# Material Declaration Data Sheet

## RAVF052D (Formerly RAVF 05-2D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **2.2976**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	0.7555	328,830	96.00%	0.7870	34.25%
	silicon dioxide	14808-60-7	0.0157	6,851	2.00%		
	magnesium oxide	1309-48-4	0.0079	3,425	1.00%		
	calcium oxide	1305-78-8	0.0079	3,425	1.00%		
Inner termination layer	silver	7440-22-4	0.4911	213,745	80.15%	0.6127	26.67%
	palladium	7440-05-3	0.0043	1,872	0.70%		
	lead borosilicate glass	undefined	0.1173	51,053	19.14%		
Resistive element	ruthenium oxide	12036-10-1	0.0212	9,227	15.38%	0.1378	6.00%
	silver	7440-22-4	0.0230	10,010	16.69%		
	palladium	7440-05-3	0.0056	2,437	4.06%		
	lead borosilicate glass	undefined	0.0880	38,301	63.86%		
Pre-coat	lead borosilicate glass	undefined	0.1271	55,319	88.51%	0.1436	6.25%
	copper oxide	1317-38-0	0.0067	2,916	4.67%		
	magnesium oxide	1309-48-4	0.0098	4,265	6.82%		
Over-coat	epoxy	67762-95-2	0.2672	116,295	100.00%	0.2672	11.63%
Middle termination layer	nickel	7440-02-0	0.1350	58,757	100.00%	0.1350	5.88%
Outer termination layer	tin	7440-31-5	0.2143	93,271	100.00%	0.2143	9.33%
Total Weight			2.2976				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF102D (Formerly RAVF 10-2D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **3.5075**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	1.5571	443,940	96.00%	1.6220	46.24%
	silicon dioxide	14808-60-7	0.0324	9,249	2.00%		
	magnesium oxide	1309-48-4	0.0162	4,624	1.00%		
	calcium oxide	1305-78-8	0.0162	4,624	1.00%		
Inner termination layer	silver	7440-22-4	0.5370	153,100	76.96%	0.6978	19.89%
	palladium	7440-05-3	0.0072	2,053	1.03%		
	lead borosilicate glass	undefined	0.1536	43,792	22.01%		
Resistive element	ruthenium oxide	12036-10-1	0.0212	6,044	15.38%	0.1378	3.93%
	silver	7440-22-4	0.0230	6,557	16.69%		
	palladium	7440-05-3	0.0056	1,597	4.06%		
	lead borosilicate glass	undefined	0.0880	25,089	63.86%		
Pre-coat	lead borosilicate glass	undefined	0.1604	45,731	89.66%	0.1789	5.10%
	copper oxide	1317-38-0	0.0082	2,338	4.58%		
	magnesium oxide	1309-48-4	0.0103	2,937	5.76%		
Over-coat	epoxy	67762-95-2	0.3070	87,527	100.00%	0.3070	8.75%
Middle termination layer	nickel	7440-02-0	0.2000	57,021	100.00%	0.2000	5.70%
Outer termination layer	tin	7440-31-5	0.3640	103,778	100.00%	0.3640	10.38%
<b>Total Weight</b>			<b>3.5075</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF104D (Formerly RAVF 10-4D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **7.6098**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	5.4557	716,928	96.00%	5.6830	74.68%
	silicon dioxide	14808-60-7	0.1137	14,936	2.00%		
	magnesium oxide	1309-48-4	0.0568	7,468	1.00%		
	calcium oxide	1305-78-8	0.0568	7,468	1.00%		
Inner termination layer	silver	7440-22-4	0.5370	70,567	76.96%	0.6978	9.17%
	palladium	7440-05-3	0.0072	946	1.03%		
	lead borosilicate glass	undefined	0.1536	20,184	22.01%		
Resistive element	ruthenium oxide	12036-10-1	0.0463	6,084	25.85%	0.1791	2.35%
	silver	7440-22-4	0.0252	3,312	14.07%		
	palladium	7440-05-3	0.0073	959	4.08%		
	lead borosilicate glass	undefined	0.1003	13,180	56.00%		
Pre-coat	lead borosilicate glass	undefined	0.1604	21,078	89.66%	0.1789	2.35%
	copper oxide	1317-38-0	0.0082	1,078	4.58%		
	magnesium oxide	1309-48-4	0.0103	1,354	5.76%		
Over-coat	epoxy	67762-95-2	0.3070	40,343	100.00%	0.3070	4.03%
Middle termination layer	nickel	7440-02-0	0.2000	26,282	100.00%	0.2000	2.63%
Outer termination layer	tin	7440-31-5	0.3640	47,833	100.00%	0.3640	4.78%
<b>Total Weight</b>			<b>7.6098</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF162D (Formerly RAVF 16-2D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **9.0159**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	6.8765	762,706	96.00%	7.1630	79.45%
	silicon dioxide	14808-60-7	0.1433	15,890	2.00%		
	magnesium oxide	1309-48-4	0.0716	7,945	1.00%		
	calcium oxide	1305-78-8	0.0716	7,945	1.00%		
Inner termination layer	silver	7440-22-4	0.5648	62,645	77.84%	0.7256	8.05%
	palladium	7440-05-3	0.0072	799	0.99%		
	lead borosilicate glass	undefined	0.1536	17,037	21.17%		
Resistive element	ruthenium oxide	12036-10-1	0.0354	3,926	16.43%	0.2154	2.39%
	silver	7440-22-4	0.0223	2,473	10.35%		
	palladium	7440-05-3	0.0710	7,875	32.96%		
	lead borosilicate glass	undefined	0.0867	9,616	40.25%		
Pre-coat	lead borosilicate glass	undefined	0.1304	14,463	87.58%	0.1489	1.65%
	copper oxide	1317-38-0	0.0082	910	5.51%		
	magnesium oxide	1309-48-4	0.0103	1,142	6.92%		
Over-coat	epoxy	67762-95-2	0.2860	31,722	100.00%	0.2860	3.17%
Middle termination layer	nickel	7440-02-0	0.1670	18,523	100.00%	0.1670	1.85%
Outer termination layer	tin	7440-31-5	0.3100	34,384	100.00%	0.3100	3.44%
<b>Total Weight</b>			<b>9.0159</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF164D (Formerly RAVF 16-4D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **16.8634**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	14.3107	848,626	96.00%	14.9070	88.40%
	silicon dioxide	14808-60-7	0.2981	17,680	2.00%		
	magnesium oxide	1309-48-4	0.1491	8,840	1.00%		
	calcium oxide	1305-78-8	0.1491	8,840	1.00%		
Inner termination layer	silver	7440-22-4	0.5666	33,599	77.89%	0.7274	4.31%
	palladium	7440-05-3	0.0072	427	0.99%		
	lead borosilicate glass	undefined	0.1536	9,108	21.12%		
Resistive element	ruthenium oxide	12036-10-1	0.0463	2,746	25.85%	0.1791	1.06%
	silver	7440-22-4	0.0252	1,494	14.07%		
	palladium	7440-05-3	0.0073	433	4.08%		
	lead borosilicate glass	undefined	0.1003	5,948	56.00%		
Pre-coat	lead borosilicate glass	undefined	0.1604	9,512	89.66%	0.1789	1.06%
	copper oxide	1317-38-0	0.0082	486	4.58%		
	magnesium oxide	1309-48-4	0.0103	611	5.76%		
Over-coat	epoxy	67762-95-2	0.3070	18,205	100.00%	0.3070	1.82%
Middle termination layer	nickel	7440-02-0	0.2000	11,860	100.00%	0.2000	1.19%
Outer termination layer	tin	7440-31-5	0.3640	21,585	100.00%	0.3640	2.16%
<b>Total Weight</b>			<b>16.8634</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF168D (Formerly RAVF 16-8D)

**Thick Film Chip Array - Convex Termination**

Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **25.1419**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	22.1664	881,652	96.00%	23.0900	91.84%
	silicon dioxide	14808-60-7	0.4618	18,368	2.00%		
	magnesium oxide	1309-48-4	0.2309	9,184	1.00%		
	calcium oxide	1305-78-8	0.2309	9,184	1.00%		
Inner termination layer	silver	7440-22-4	0.5430	21,597	76.53%	0.7095	2.82%
	palladium	7440-05-3	0.0083	330	1.17%		
	lead borosilicate glass	undefined	0.1582	6,292	22.30%		
Resistive element	ruthenium oxide	12036-10-1	0.0545	2,168	27.15%	0.2007	0.80%
	silver	7440-22-4	0.0282	1,122	14.05%		
	palladium	7440-05-3	0.0091	362	4.53%		
	lead borosilicate glass	undefined	0.1089	4,331	54.26%		
Pre-coat	lead borosilicate glass	undefined	0.1789	7,116	89.76%	0.1993	0.79%
	copper oxide	1317-38-0	0.0092	366	4.62%		
	magnesium oxide	1309-48-4	0.0112	445	5.62%		
Over-coat	epoxy	67762-95-2	0.3465	13,782	100.00%	0.3465	1.38%
Middle termination layer	nickel	7440-02-0	0.2130	8,472	100.00%	0.2130	0.85%
Outer termination layer	tin	7440-31-5	0.3829	15,230	100.00%	0.3829	1.52%
<b>Total Weight</b>			<b>25.1419</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF324D (Formerly RAVF 32-4D)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **38.3079**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	32.2022	840,616	96.00%	33.5440	87.56%
	silicon dioxide	14808-60-7	0.6709	17,513	2.00%		
	magnesium oxide	1309-48-4	0.3354	8,756	1.00%		
	calcium oxide	1305-78-8	0.3354	8,756	1.00%		
Inner termination layer	silver	7440-22-4	1.5340	40,044	78.65%	1.9504	5.09%
	palladium	7440-05-3	0.0210	548	1.08%		
	lead borosilicate glass	undefined	0.3954	10,322	20.27%		
Resistive element	ruthenium oxide	12036-10-1	0.1243	3,245	35.79%	0.3473	0.91%
	silver	7440-22-4	0.0076	198	2.19%		
	palladium	7440-05-3	0.0179	467	5.15%		
	lead borosilicate glass	undefined	0.1975	5,156	56.87%		
Pre-coat	lead borosilicate glass	undefined	0.6474	16,900	89.73%	0.7215	1.88%
	copper oxide	1317-38-0	0.0329	859	4.56%		
	magnesium oxide	1309-48-4	0.0412	1,075	5.71%		
Over-coat	epoxy	67762-95-2	0.8855	23,115	100.00%	0.8855	2.31%
Middle termination layer	nickel	7440-02-0	0.3020	7,883	100.00%	0.3020	0.79%
Outer termination layer	tin	7440-31-5	0.5572	14,545	100.00%	0.5572	1.45%
<b>Total Weight</b>			<b>38.3079</b>				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF328N (Formerly RAVF 32-8N)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **22.1342**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	16.2979	736,323	96.00%	16.9770	76.70%
	silicon dioxide	14808-60-7	0.3395	15,340	2.00%		
	magnesium oxide	1309-48-4	0.1698	7,670	1.00%		
	calcium oxide	1305-78-8	0.1698	7,670	1.00%		
Inner termination layer	silver	7440-22-4	1.5340	69,305	78.65%	1.9504	8.81%
	palladium	7440-05-3	0.0210	949	1.08%		
	lead borosilicate glass	undefined	0.3954	17,864	20.27%		
Resistive element	ruthenium oxide	12036-10-1	0.2023	9,140	27.32%	0.7406	3.35%
	silver	7440-22-4	0.1103	4,983	14.89%		
	palladium	7440-05-3	0.0324	1,464	4.37%		
	lead borosilicate glass	undefined	0.3956	17,873	53.42%		
Pre-coat	lead borosilicate glass	undefined	0.6474	29,249	89.73%	0.7215	3.26%
	copper oxide	1317-38-0	0.0329	1,486	4.56%		
	magnesium oxide	1309-48-4	0.0412	1,861	5.71%		
Over-coat	epoxy	67762-95-2	0.8855	40,006	100.00%	0.8855	4.00%
Middle termination layer	nickel	7440-02-0	0.3020	13,644	100.00%	0.3020	1.36%
Outer termination layer	tin	7440-31-5	0.5572	25,174	100.00%	0.5572	2.52%
Total Weight			22.1342				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.



# Material Declaration Data Sheet

## RAVF328R (Formerly RAVF 32-8R)

**Thick Film Chip Array - Convex Termination**



Date: **January 7, 2013** Max Temp: **260°C** (Contact factory for detailed soldering recommendations.)  
 Component Weight (mg): **22.1342**

BOM Item	Material	CAS Number	Material Weight (mg)	Material PPM of Component	Material % of BOM Item	BOM Item Weight (mg)	BOM Item % of Component
Ceramic substrate	aluminum oxide	1344-28-1	16.2979	736,323	96.00%	16.9770	76.70%
	silicon dioxide	14808-60-7	0.3395	15,340	2.00%		
	magnesium oxide	1309-48-4	0.1698	7,670	1.00%		
	calcium oxide	1305-78-8	0.1698	7,670	1.00%		
Inner termination layer	silver	7440-22-4	1.5340	69,305	78.65%	1.9504	8.81%
	palladium	7440-05-3	0.0210	949	1.08%		
	lead borosilicate glass	undefined	0.3954	17,864	20.27%		
Resistive element	ruthenium oxide	12036-10-1	0.2023	9,140	27.32%	0.7406	3.35%
	silver	7440-22-4	0.1103	4,983	14.89%		
	palladium	7440-05-3	0.0324	1,464	4.37%		
	lead borosilicate glass	undefined	0.3956	17,873	53.42%		
Pre-coat	lead borosilicate glass	undefined	0.6474	29,249	89.73%	0.7215	3.26%
	copper oxide	1317-38-0	0.0329	1,486	4.56%		
	magnesium oxide	1309-48-4	0.0412	1,861	5.71%		
Over-coat	epoxy	67762-95-2	0.8855	40,006	100.00%	0.8855	4.00%
Middle termination layer	nickel	7440-02-0	0.3020	13,644	100.00%	0.3020	1.36%
Outer termination layer	tin	7440-31-5	0.5572	25,174	100.00%	0.5572	2.52%
Total Weight			22.1342				

Note: Lead oxide contained in glass frit is part of the thick film formulations. This lead content is covered by exemption 7c-I of the Directive Annex ("... electronic components containing lead in a glass..."). Weights are approximate.