SMPS Ceramic Capacitors - Ordering Information

P	B	4	N	1	BX	475	K	B

SMPS Capacitor Family

Voltage			
G	50V	R	200V
B	100V	S	500V

Case Code *(see dimension chart)*

Lead Style			
N	Straight (thru hole)	L	Leads formed out
J	Leads formed in	M	Without leads

Coating	
1	Uncoated
2	Coated

TC			
BX	BX	BG	X7R
BR	BR	BY	NPO

Capacitance

(*expressed in pF*)
First two digits are significant, third digit is number of zeros.

Tolerance			
J	±5%	M	± 20%
K	± 10%		

Test Level			
A	Electrical Screening Only	C	HiRel Group B or C
B	MIL-PRF-49478 Group A	X	Special Screening

Ordering Information for DSCC Drawings 87106 & 88011

Part Identification Number 87106 - XXX - X

Vendor CAGE Number
OYBX7

Drawing Number
Dash Number
Lead - N Standard - Do not specify - For J or L lead use suffix

Notes:

1. Dimensions are in inches.
2. Unless otherwise specified, tolerances are ± .010 inch (0.25 mm).
3. Lead frame configuration is shown as typical above the seating plane.
4. See Table I for specific maximum A dimension. For maximum B dimension, add .065 inch (1.65 mm) to the appropriate A dimension. For all lead styles, the number of chips is determined by the capacitance and voltage rating.
5. For case code 5, dimensions shall be .100 inch (2.54 mm) maximum and .012 inch (0.30 mm) minimum.
6. Lead alignment within pin rows shall be within ± .005 inch (0.13 mm).

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Military Series DSCC Drawings 87106 and 88011 - PERFORMANCE REQUIREMENTS

Design, construction, and physical dimensions: The design, and construction, shall be as specified in MIL-PRF-49470 and physical dimensions shall be as specified in Outline Drawing and Dimension Chart.

Temperature Coefficient

DSCC Drawing	Voltage	Bias = 0 Voltage	Bias = Rated Voltage
87106	50/100V	± 15%	+ 15, - 25%
87106	200V	± 15%	+ 15, - 40%
87106	500V	± 15%	+ 15, - 50%
88011	All Voltages	0 ± 30 ppm/˚C	0 ± 30 ppm/˚C

Capacitance - *See Table 1*: Measured in accordance with MIL-STD-202, method 305 (1kHz ± 100Hz at 1.0 Vrms at 25˚C).

Dissipation Factor: Dissipation factor shall be 2.5 percent maximum (measured under the same conditions as capacitance). *COG: Dissipating factor shall be 0.15% maximum for 88011.*

Insulation Resistance: a) At + 25˚C, rated voltage : 100KMΩ or 1,000MΩ - µF, whichever is less
b) At +125˚C, rated voltage : 10KMΩ or 100MΩ - µF, whichever is less

Dielectric Withstanding Voltage: Dielectric withstanding voltage shall be 2.5 times rated voltage except 500 V rated parts at 1.5 times rates voltage. In accordance with MIL-PRF-49470.

Aging Rate: Aging rate shall be -2.0 percent maximum for each decade-hour for 87106. N/A for 88011.

Capacitor Tolerance: K = ± 10 percent, M = ± 20 percent for 87106.
J = ± 5 percent, K = ± 10 percent for 88011.

Solderability of terminals: In accordance with MIL-PRF-49470.

Resistance to Soldering Heat: In accordance with MIL-PRF-49470.

Shock: In accordance with MIL-PRF-49470.

Immersion Cycling: In accordance with MIL-PRF-49470.

Moisture Resistance: In accordance with MIL-PRF-49470.

Life: Life shall be 200 percent of voltage except 500 V rated parts at 120 percent of rated voltage applied at +125˚C for 1,000 hours in accordance with MIL-PRF-49470.

Thermal Shock: In accordance with MIL-PRF-49470.

Voltage Conditioning: In accordance with MIL-PRF-49470 except 500V rated parts at 120% of rated voltage at 125˚C.

Terminal Strength: In accordance with MIL-PRF-49470 (each lead shall be bent away from capacitor body 90˚ from the original position and then tested in accordance with Method 211 of MIL-STD-202).

Marking: Marking shall be in accordance with MIL-STD-1285, except the P/N shall be as specified in paragraph 1.2 of 87106, or 88011. The manufacture's name or code and date code as a minimum, except case size 4 and 5 shall be marked with coded cap and tolerance minimum. Full marking shall be included on the package.

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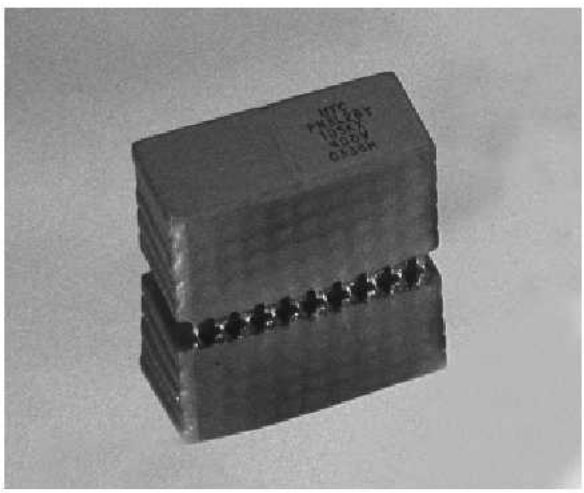
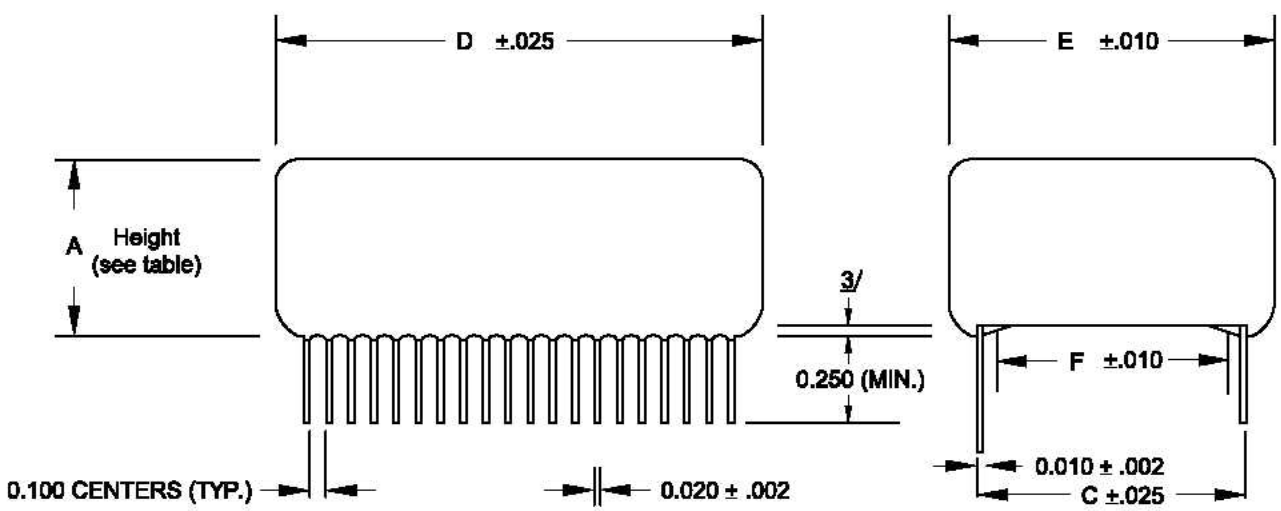
- Epoxy Conformal Coated High Frequency Switch Mode Power Supply Capacitor
- Intended for use in airborne electronic equipment
- Rugged epoxy coating
- Increased mechanical protection and environmental protection
- NPO and X7R Dielectrics
- 50-500 VDC Ratings
- N, J or L Lead styles available
- Low ESR and ESL





Dimension Chart

CASE CODE	DIM A MAX 1/	DIM B MAX 2/	DIM C ±.025	DIM D MIN	DIM D MAX	DIM E MAX	DIM F MIN	LEADS PER SIDE
1	.655	.715	.450	1.950	2.100	.525	.180	20
2	.655	.715	.800	1.450	1.560	.595	.530	15
3	.655	.715	.450	0.950	1.080	.525	.180	10
4	.655	.715	.400	0.350	0.45	.465	.180	4
5	.655	.715	.250	0.224	0.300	.325	.080	3
6	.655	.715	1.250	1.950	2.100	1.375	.980	20

1/ Reference Table 1 for number of chips in the stack ("Chip #") and multiply by 0.120" for the actual DIM A.
2/ Add 0.050" to the value obtained in 1/ for the actual DIM B.
3/ No coating below seating plane.

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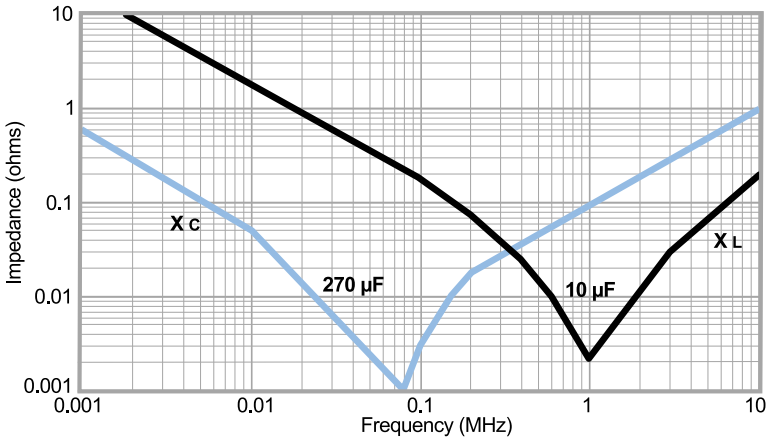
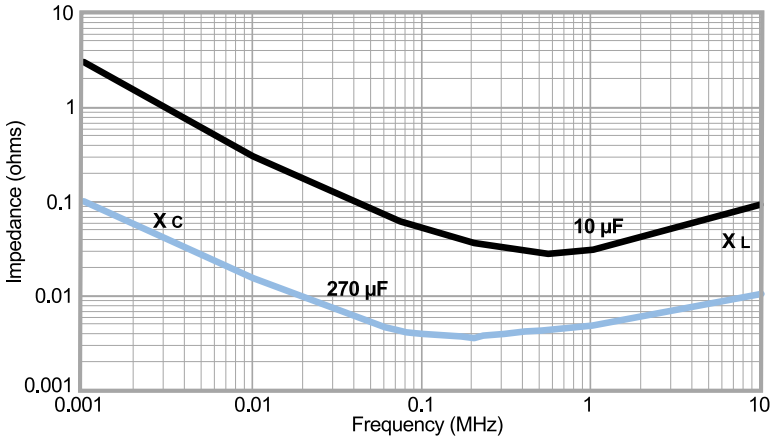
Typical ESR and ESL vs. Frequency

Charts for SMPS - Typical

ESR vs. Frequency



ESL vs. Frequency



MIL-PRF-49470 (Equivalent)

Union Technology Corp. is a qualified supplier using MIL-STD-790 inspection criteria. We have manufactured thousands of parts to DSCC drawings 87106 and 88011 during the past years. A number of key customers have asked us to produce these parts with additional high reliability screening to their requirements or developed specification control drawings. We can screen products in conformance to MIL-PRF-49470.

Custom Products and Application Specific Devices

Our engineering staff is ready to address your need for application specific products. We have assembled a wide variety of devices meeting unique customer requirements. Our staff is ready to address your special requirements by modifying existing designs or creating a new design. We can employ a variety of chip sizes and configurations. Please contact the factory for additional information.

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Cap.	50VDC						100VDC						200VDC						500VDC					
uF	N Lead		J Lead		Case	MAX	N Lead		J Lead		Case	MAX	N Lead		J Lead		Case	MAX	N Lead		J Lead		Case	MAX
	+/- 10%	+/- 20%	+/- 10%	+/- 20%	Code	DIM A	+/- 10%	+/- 20%	+/- 10%	+/- 20%	Code	DIM A	+/- 10%	+/- 20%	+/- 10%	+/- 20%	Code	DIM A	+/- 10%	+/- 20%	+/- 10%	+/- 20%	Code	DIM A
0.15																			173	174	421	422	5	.120
0.18																			175	176	423	424	5	.240
0.22																			177	178	425	426	5	.240
0.27																			179	180	427	428	5	.240
0.33																			181	182	429	430	5	.360
0.39																			183	184	431	432	5	.360
0.47													113	114	361	362	5	.240	185	186	433	434	5	.360
0.56													115	116	363	364	5	.240	187	188	435	436	5	.480
0.68							055	056	301	302	5	.120	117	118	365	366	5	.360	189	190	437	438	5	.650
0.82							057	058	303	304	5	.240	119	120	367	368	5	.360	231	232	439	440	4	.360
1.0	001	002	241	242	5	.120	059	060	305	306	5	.240	121	122	369	370	5	.480	191	192	441	442	4	.360
1.2	003	004	243	244	5	.120	061	062	307	308	5	.240	123	124	371	372	5	.480	193	194	443	444	4	.360
1.5	005	006	245	246	5	.240	063	064	309	310	5	.360	125	126	373	374	5	.650	195	196	445	446	4	.480
1.8	007	008	247	248	5	.240	065	066	311	312	5	.360	127	128	375	376	4	.360	197	198	447	448	4	.650
2.2	009	010	249	250	5	.240	067	068	313	314	5	.480	129	130	377	378	4	.360	233	234	449	450	3	.240
2.7	011	012	251	252	5	.360	069	070	315	316	5	.480	131	132	379	380	4	.480	199	200	451	452	3	.360
3.3	013	014	253	254	5	.360	071	072	317	318	5	.650	133	134	381	382	4	.480	201	202	453	454	3	.360
3.9	015	016	255	246	5	.480	073	074	319	320	4	.360	135	136	383	384	4	.650	203	204	455	456	3	.360
4.7	017	018	257	258	5	.480	075	076	321	322	4	.360	137	138	385	386	3	.240	205	206	457	458	3	.480
5.6	019	022	259	260	5	.560	077	078	323	324	4	.480	139	140	387	388	3	.240	207	208	459	460	3	.650
6.8	223	224	261	262	4	.360	079	080	325	326	4	.480	141	142	389	390	3	.360	235	236	461	462	1	.480
8.2	021	022	263	264	4	.360	081	082	327	328	4	.650	143	144	391	392	3	.360	209	210	463	464	1	.480
10	023	024	265	266	4	.480	229	230	329	330	3	.240	145	146	393	394	3	.480	211	212	465	466	1	.480
12	025	026	267	268	4	.480	083	084	331	332	3	.240	147	148	395	396	3	.650	213	214	467	468	1	.650
15	027	028	269	270	4	.650	085	086	333	334	3	.360	149	150	397	398	1	.360	237	238	469	470	2	.650
18	029	030	271	272	3	.240	087	088	335	336	3	.360	151	152	399	400	1	.480	215	216	471	472	2	.360
22	031	032	273	274	3	.360	089	090	337	338	3	.480	153	154	401	402	1	.650	239	240	473	474	6	.360
27	033	034	275	276	3	.360	091	092	339	340	3	.650	155	156	403	404	1	.650	217	218	475	476	6	.360
33	035	036	277	278	3	.360	093	094	341	342	1	.360	157	158	405	406	2	.480	219	220	477	478	6	.480
39	037	038	279	280	3	.480	095	096	343	344	1	.480	159	160	407	408	2	.650	221	222	479	480	6	.650
47	039	040	281	282	3	.650	097	098	345	346	1	.480	161	162	409	410	6	.240		-	-	-	-	
56	225	226	283	284	1	.360	099	100	347	348	1	.650	163	164	411	412	6	.360		-	-	-	-	
68	041	042	285	286	1	.480	101	102	349	350	2	.480	165	166	413	414	6	.360		-	-	-	-	-
82	043	044	287	288	1	.480	103	104	351	352	2	.650	167	168	415	416	6	.480		-	-	-	-	-
100	045	046	289	290	1	.650	105	106	353	354	6	.360	169	170	417	418	6	.650		-	-	-	-	-
120	227	228	291	292	2	.480	107	108	355	356	6	.360	171	172	419	420	6	.650		-	-	-	-	-
150	047	048	293	294	2	.650	109	110	357	358	6	.480								-	-	-	-	-
180	049	050	295	296	6	.480	111	112	359	360	6	.650								-	-	-	-	-
220	051	052	297	298	6	.480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
270	053	054	299	300	6	.650	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: *"N" lead configuration is standard.*
"J" or "L" lead configurations can be obtained by adding the letter as a suffix to the dash number.

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Cap. µF	50VDC				100VDC				200VDC				500VDC			
	N Lead		CASE	MAX	N Lead		CASE	MAX	N Lead		CASE	MAX	N Lead		CASE	MAX
	+/- 5%	+/- 10%	CODE	DIM A	+/- 5%	+/- 10%	CODE	DIM A	+/- 5%	+/- 10%	CODE	DIM A	+/- 5%	+/- 10%	CODE	DIM A
0.01													181	182	5	.120
0.012													183	184	5	.120
0.015													185	186	5	.240
0.018													187	188	5	.240
0.022									121	122	5	.120	189	190	5	.360
0.027									123	124	5	.240	191	192	5	.360
0.033									125	126	5	.240	193	194	5	.480
0.039									127	128	5	.240	195	196	5	.480
0.047					061	062	5	.240	129	130	5	.360	197	198	5	.650
0.056	001	002	5	.120	063	064	5	.240	131	132	5	.360	199	200	4	.360
0.068	003	004	5	.240	065	066	5	.240	133	134	5	.480	201	202	4	.360
0.082	005	006	5	.240	067	068	5	.240	135	136	5	.480	203	204	4	.480
0.1	007	008	5	.240	069	070	5	.360	137	138	5	.650	205	206	4	.480
0.12	009	010	5	.360	071	072	5	.360	139	140	4	.360	207	208	4	.650
0.15	011	012	5	.360	073	074	5	.480	141	142	4	.360	209	210	3	.240
0.18	013	014	5	.480	075	076	5	.480	143	144	4	.480	211	212	3	.240
0.22	015	016	5	.480	077	078	5	.650	145	146	4	.480	213	214	3	.360
0.27	017	018	5	.650	079	080	4	.360	147	148	4	.650	215	216	3	.360
0.33	019	020	4	.360	081	082	4	.480	149	150	3	.240	217	218	3	.480
0.39	021	022	4	.480	083	084	4	.480	151	152	3	.240	219	220	3	.650
0.47	023	024	4	.480	085	086	4	.650	153	154	3	.360	221	222	1	.360
0.56	025	026	4	.240	087	088	4	.650	155	156	3	.360	223	224	1	.480
0.68	027	028	3	.240	089	090	3	.240	157	158	3	.480	225	226	1	.480
0.82	029	030	3	.240	091	092	3	.360	159	160	3	.650	227	228	1	.650
1	031	032	3	.360	093	094	3	.360	161	162	3	.650	229	230	2	.480
1.2	033	034	3	.360	095	096	3	.480	163	164	1	.480	231	232	2	.650
1.5	035	036	3	.480	097	098	3	.480	165	166	1	.480	233	234	6	.360
1.8	037	038	3	.480	099	100	3	.650	167	168	1	.650	235	236	6	.480
2.2	039	040	3	.650	101	102	1	.480	169	170	2	.480	237	238	6	.650
2.7	041	042	1	.360	103	104	1	.480	171	172	2	.650				
3.3	043	044	1	.480	105	106	1	.650	173	174	6	.360				
3.9	045	046	1	.480	107	108	2	.480	175	176	6	.360				
4.7	047	048	1	.650	109	110	2	.650	177	178	6	.480				
5.6	049	050	2	.650	111	112	6	.360	179	180	6	.650				
6.8	051	052	6	.360	113	114	6	.650								
8.2	053	054	6	.360	115	116	6	.480								
10	055	056	6	.480	117	118	6	.650								
12	057	058	6	.480	119	120	6	.650								
15	059	060	6	.650				-								

Note: *"N" lead configuration is standard.*
"J" or "L" lead configurations can be obtained by adding the letter as a suffix to the dash number.

General Soldering Guidelines

The SMPS series capacitors are generally quite large relative to other types of MLC Capacitors. Because of the size, precautions must be taken before introducing the SMPS capacitors to any soldering operation in order to prevent thermal shock. Preheating the SMPS prior to soldering is essential. The heating rate of the SMPS ceramic body during the preheat must not exceed 2˚C/per second. The maximum preheat temperature must be below, but within 50˚C of the soldering temperature (solder bath, soldering iron tip, etc.) and the SMPS temperature should be stable at the maximum preheat temperature prior to soldering. Assembly of the SMPS is done with Sn10/Pb88/Ag2/solidus 268˚C, liquidus 299˚C.

Reliability Program

Product reliability is a high priority at UTC. We design our products with robust construction. As a result many of our products go into systems, that are "mission critical", which may be non-retrievable, and / or manned flight or space flight. A reliable part is one that can withstand installation, testing, and long term field use, without degradation of the part mechanically or electrically, in the specified environment (i.e., shock, vibration, high moisture, extreme thermal change, etc.). To determine if a part will meet these requirements, continuous and periodic testing is conducted at Union Technology.

Manufacturing Yield losses and Infant Mortality Figures

Manufacturing yield losses and infant mortality figures (group A inspection, specifically voltage conditioning) are recorded in a database for the purpose of reviewing historical data, discovering quality trends and implementing preventative action before they become a reliability concern. A product lot can be compare with similar design lots that have been produced in a certain time period, to detect if product quality is changing. Statistical process control, with upper and lower control limits, is in place to alert operators, inspectors and technicians of any potential substandard product performance.

Life Test for Intrinsic Failure Rates and Wear Out Patterns

Intrinsic failure rates and wear out patterns are monitored closely by recording life test information into a database and reviewing the historical data. Long-term reliability is calculated on the number of failures experienced in the total number of test hours. Both increased temperature and voltage, accelerate the condition of life test, and are expressed in the following formulas:

Temperature acceleration = $10((TT - TA)/25)$

Where:
TT = test temperature in ˚C
TA = application temperature in ˚C

Voltage acceleration = $(TT - TA)^3$

Where:
VT = test voltage
VA = application voltage

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