



Application and Design Factors

SERIES OPERATION

Life of a lamp can be severely reduced by using a series application because of the different resistances of the lamps used in the series. The applied voltage is not distributed evenly over all of the lamps in the series, so each lamp is operating at a slightly different voltage. This means embrittlement and the evaporation rate will not be equal, so some lamps could fail prematurely. It is recommended that lamps be selected for amperage and operated at a derated voltage for maximum reliability in series operations.

SHOCK AND VIBRATION

The best filament design for use in a shock and vibration environment is a low voltage, high amperage filament. This represents a short, thick filament. The higher you go in voltage, the longer the filament, which then necessitates the use of hangers. The hangers will increase the higher voltage filament reliability, but the effects of notching due to the soret effect are increased.

Orientation of the filament in relationship to the axis of vibration will also affect the lamp performance in a shock and vibration environment.

The most critical consideration in protecting a lamp against the effects of shock and vibration is the packaging by the user. Filament damage, due to shock and vibration, can be reduced or amplified by the way the lamp has been assembled into the user's product.

DC VOLTAGE LAMP OPERATION

DC voltage can reduce life by approximately 50% - 70% due to the "sawtooth" or notching effect. Notching, also known as electromigration, is a change in the molecular structure of tungsten due to the DC voltage. The results are hot spots that accelerate the thermal conditions, the evaporation rate and embrittlement. DC voltage operation is not recommended for filament lamps.

130 VOLT FILAMENTS

Most line voltage lamps offered in this catalog are manufactured with a 130 volt filament. Since most line voltage power is applied at 120 volts, the result is a slight undervolting of the filament. The effect of this is substantially enhanced lifehours, protection from voltage spikes and energy cost savings.

APPLICATION RECOMMENDATIONS

- Consult us in the early stages of design for technical assistance and recommendations as to the best lamp to use for a specific application. We can offer a variety of customized lamps which include lamps that have longer or shorter leads, bent or formed leads, and/or electrical characteristics that are tailored to your individual requirements.
- Use low voltage, high amperage lamps for shock and vibration environments.
- Provide good heat sinking and airflow to keep the ambient temperature below 100 degrees Celsius.
- Derate the lamps, whenever possible, to reduce tungsten evaporation and increase life.
- Use AC voltage over DC voltage, when possible.
- Use the lowest efficacy lamps for the longest life. Consider reflective coatings, contrast filters, or lenses for increased luminance or enhancement.
- Design your system to insulate the lamps as much as possible from the effects of shock and vibration.
- Take care in handling — avoid excessive shock and vibration during packaging, shipping and production. Avoid lead bending or stress at the seal area to prevent vacuum leaks.
- Avoid excessive torque during lamp insertion.

AMBIENT TEMPERATURE

It is important to consider the lamp housing from the standpoints of radiation, absorption, and ventilation. Normal variations in ambient temperature do not affect the performance of lamps. Above 175°C (350°F), the solder on conventional lamps may soften, deform, or melt, and the basing cement may loosen. All-glass wedge base lamps can be operated in lamp ambient temperatures of up to 230°C (450°F).

SOLDER READY LEADS

All wire terminal lamps offered in this catalog are supplied in solder ready condition. After the manufacturing process, wire terminals are washed clean and tin plated in order to provide for reliable soldering.

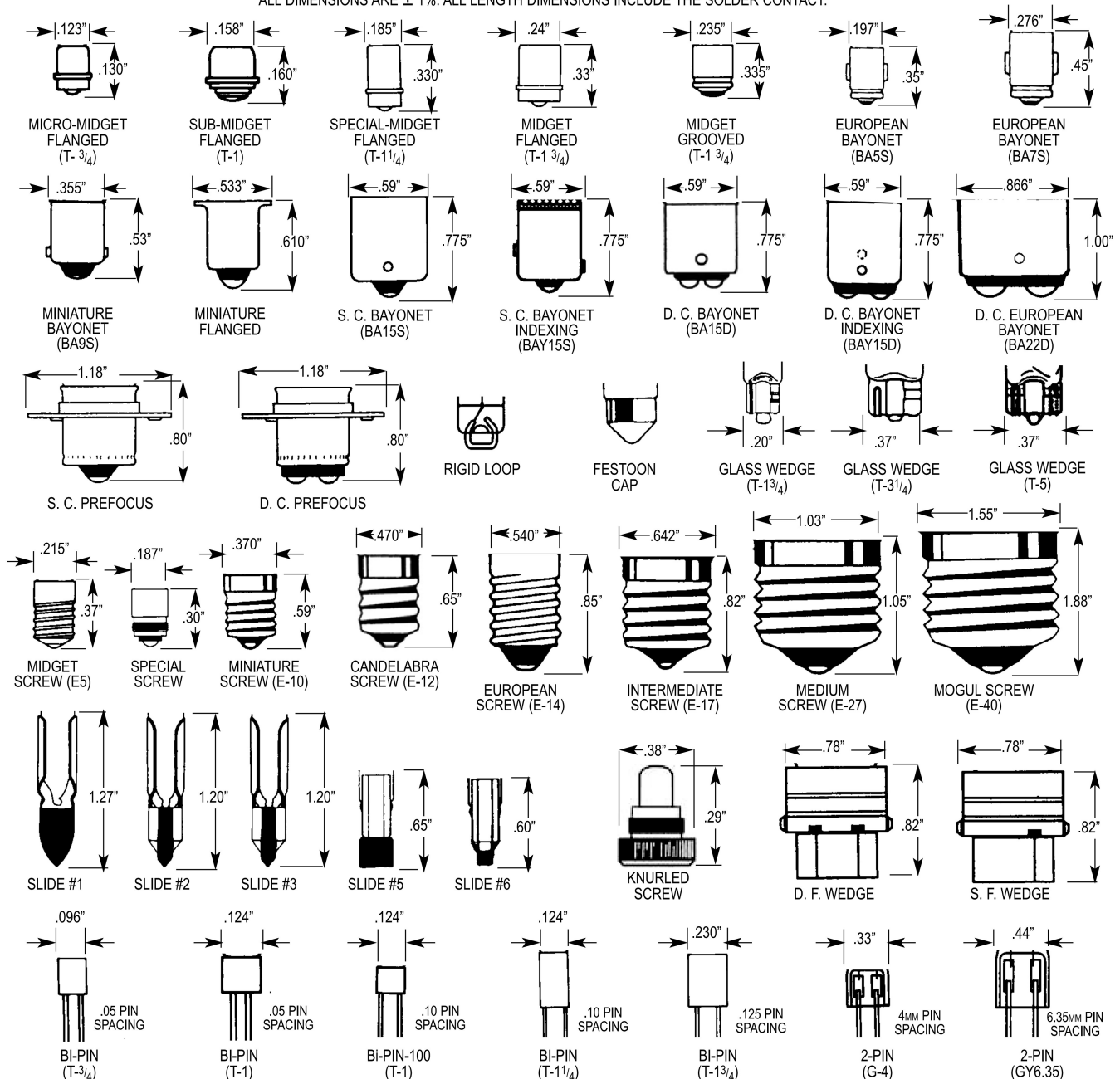


Common Lamp Bases with Dimensions

Bases provide electrical contact to the lamp and, in most cases, also support the lamp in the fixture. For miniature and subminiature lamps, bayonet or wedge base types are generally preferred over

screw types when vibration is present. In addition, wedge bases reduce socket size and complexity. Flanged or collared types are usually associated with requirements for filament location.

ALL DIMENSIONS ARE $\pm 1\%$. ALL LENGTH DIMENSIONS INCLUDE THE SOLDER CONTACT.

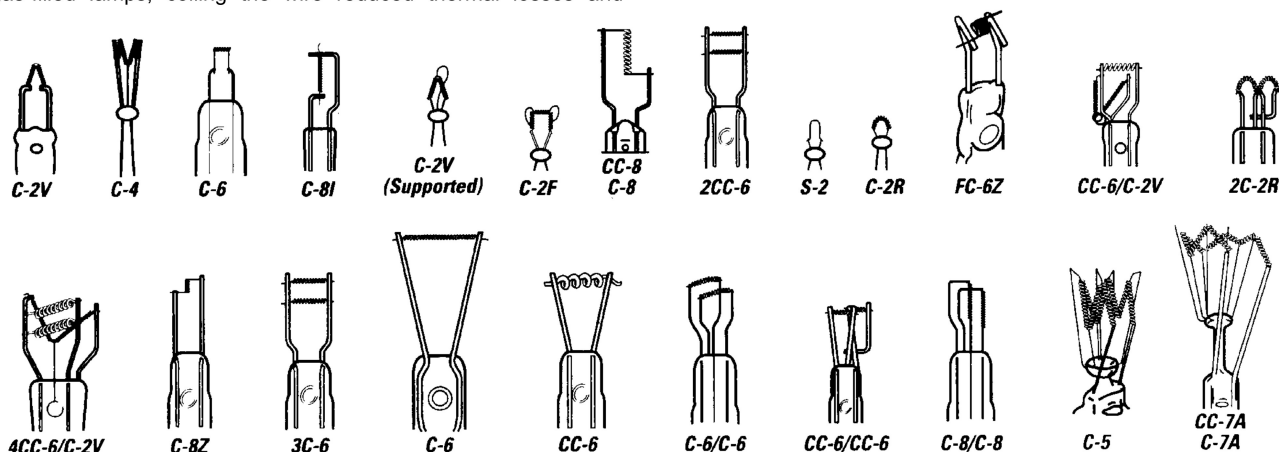




Common Filament Arrangements

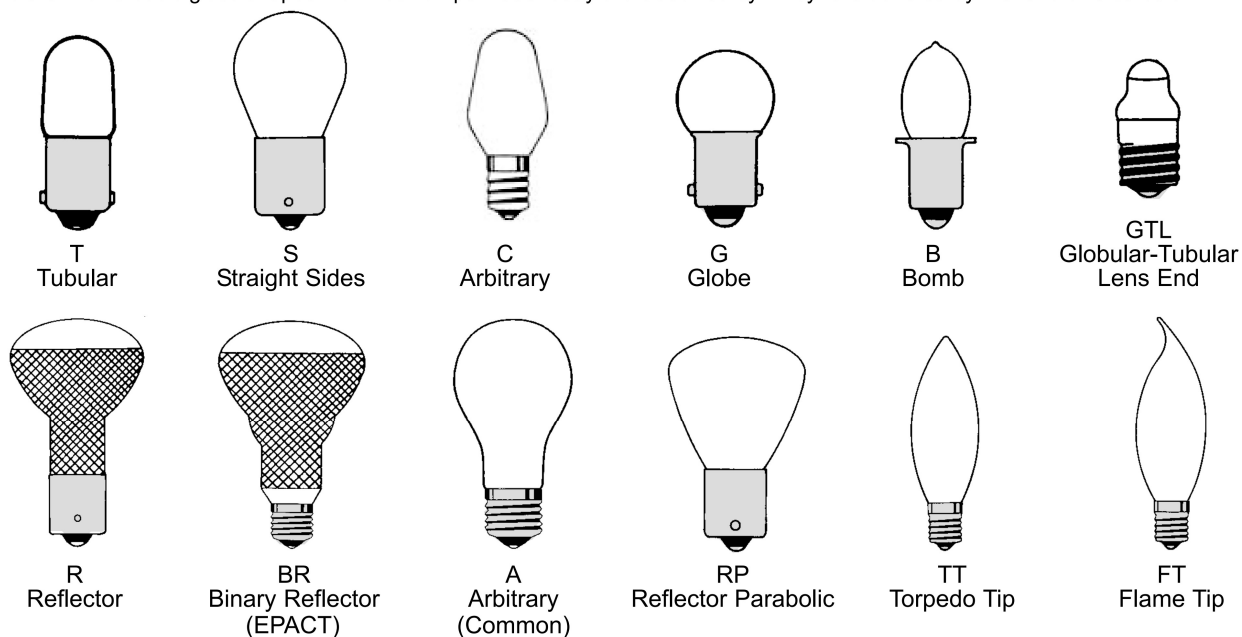
Filaments for miniature and subminiature lamps may be a straight wire, a coil, or a coiled coil (indicated by the letters "S", "C", and "CC" respectively). Coiling the filament wire effectively shortens the filament length so that smaller bulbs can be used. In addition, in gas-filled lamps, coiling the wire reduced thermal losses and

increases efficiency. Tungsten is almost universally used as lamp filament material because of its high melting point at incandescence. The number following the coil identification letter(s) denoted the arrangement of the filaments on the supports.



Basic Lamp Shapes (Glass Only)

There are twelve basic glass shapes that most lamps made today are classified by. They are denoted by the letters listed below.





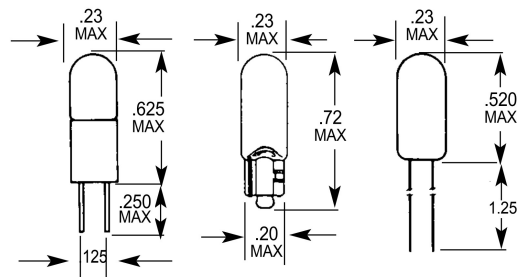
Miniature Lamps

Incandescence • Neon • European

T-1 3/4

SUB-MINIATURE LAMPS

Wire Terminal Lamps are tin plated for solder-ready applications.
Bi-Pin Lamps are manufactured with gold plated pins.



LINE NO.	VOLTS	AMPS	MSCP	LIFE	FILAMENT	BI-PIN BASE	WEDGE BASE	WIRE TERMINAL
1	1.30	.050	.020	50	S-2			2184
2	1.35	.060	.010N	500	C-2R	7931		1728
3	2.00	.060	.020	5,000	C-2R			2119
4	2.50	.200	.220	500	C-2R	7968		1783
5	2.50	.350	.210	10,000	C-2R	7868		2169
6	2.70	.060	.040	6,000	C-2R	7838		1738
7	4.50	.120	.050	25,000	C-2V	7359		2171
8	5.00	.017	.018N	8,000	C-2R	7950		3950
9	5.00	.060	.050	100,000	C-2R	7361		2200
10	5.00	.060	.030	100,000	C-2R	7360		8805
11	5.00	.115	.150	40,000	C-2R	7362	56	2203
12	5.00	.190	.450	1,000	C-2R	7363		8784
13	6.00	.036	.014	40,000	C-2V			2191
14	6.00	.040	.030	10,000	C-2V	7945		1730
15	6.00	.200	.600	1,000	C-2R	7328	79	1784
16	6.00	.200	.100	50,000	C-2F	7364		8664
17	6.00	.220	.630	3,000	C-2R	7365		
18	6.30	.040	.020N	50,000	C-2V	7380		2180
19	6.30	.040	.030	20,000	C-2V		84	2179
20	6.30	.075	.220	500	C-2R	7377		1739
21	6.30	.150	.450	3,000	C-2R	7368		8350
22	6.30	.200	.400	50,000	C-2F	7381	86	2181
23	6.30	.200	.550	3,000	C-2R	7349		2112
24	10.00	.010	.006	50,000	C-2F			2149
25	10.00	.014	.002N	10,000	C-2F	7344		1869
26	10.00	.040	.080	5,000	C-2F	7367		2107
27	11.00	.022	.030	10,000	C-2F	7369		8946
28	14.00	.040	.130	5,000	C-2F		18	
29	12.00	.040	.120	10,000	C-2F	7371		2174
30	14.00	.080	.300	40,000	C-2F		73	2382X
31	14.00	.080	.300	50,000	C-2F	7382		2182
32	14.00	.080	.500	1,500	C-2F	7330	37	1705
33	14.00	.100	.500	10,000	C-2F	7373		2162
34								
35	14.00	.100	.500	10,000	C-2F		70	
36	18.00	.040	.150	10,000	C-2F	7370		2102
37	14.00	0.16	.700	1,500	C-2F		74	
38	22.00	.040	.300	2,000	C-2F	7459		8425
39	24.00	.050	.500	2,000	C-2F	7001		2176
40	28.00	.040	.340	7,000	C-2F	7327		1764
41	28.00	.040	.300	25,000	C-2F	7387	85	2187
42	28.00	.040	.340	4,000	C-2F			1762
43	28.00	.040	.340	4,000	C-2F			2148
44	28.00	.040	.200	50,000	C-2F	7374		2185
45	28.00	.060	.340	25,000	C-2F	7876		1764LSV
46	28.00	.065	.650	5,000	C-2F	7376	17	8361
47	48.00	.025	.200	5,000	CC-2F			6748