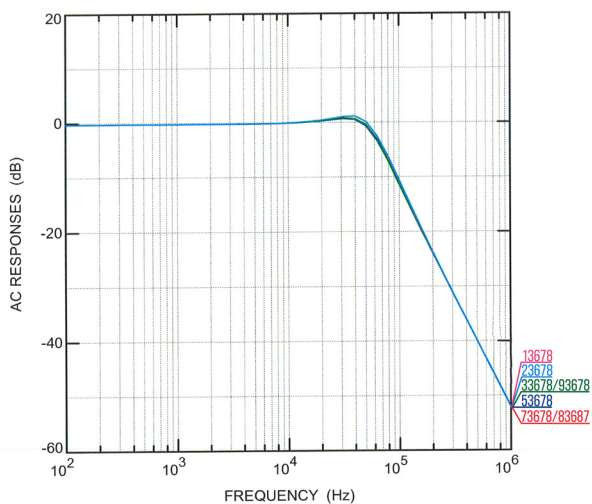


*3678 Hybrid EMI Filter Application Notes

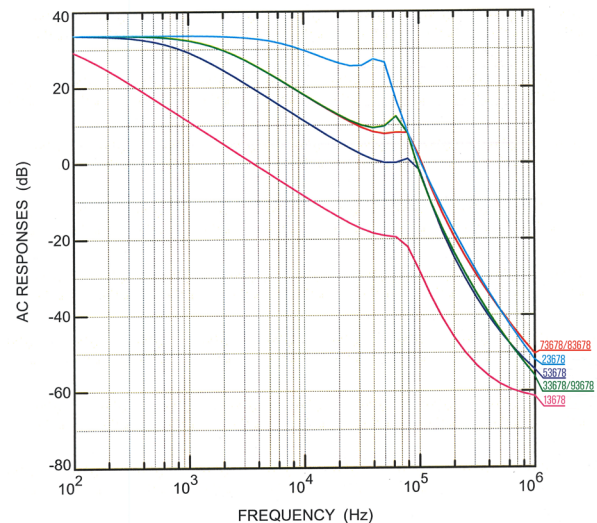
MDI's *3678 series of EMI filters are designed to "up-rev" DC-DC converters with built in MIL-STD-461C EMI filters to MIL-STD-461D, E, F, G requirements. They connect between + Input and Input RTN of the converter and the power source. One MDI *3678 can filter multiple DC-DC converters up to the *3678 current rating.

Model *3678 is a compact, low attenuation solution that allows users of DC-DC converters with internal MIL-STD-461C CE03 filters to meet MIL-STD-461D, E, F, G CE102 requirements. *3678 filters incorporate a common mode stage and two low attenuation, low resonance differential filters. This design minimizes the possibility of excessive input filter impedance that might otherwise result in DC-DC converter loop instability (e.g. Middlebrook effects).

*3678 Product Family Selection Guide				
Model Number	Input Nominal Volts DC	Input Range Volts DC	Rated Current Amperes	Rated Power Dissipation (Pd) Watts
13678	12	4.6 – 16	7	1.4
53678	28	16 – 50	7	1.4
73678	50	30 – 75	7	1.4
83678	70	55 – 90	4	1.4
96378	100	80 – 120	2.5	0.7
33678	120	86 – 158	2.5	0.7
23678	270	185 – 335	1	0.5



Typical Insertion loss - Common Mode



Typical Insertion loss - Differential Mode

Specification Ratings

The nominal input voltage is the common terminology for the input bus; input voltage ranges are expressed to demonstrate that internal components have derating to support low voltage (max. current stress) and high voltage (max. voltage stress) for safe operation. The internal components of the *3678 filters are fully derated to support stated operation up to grade level baseplate operating temperature without further derating the filter module.

In many cases, input voltages other than those shown can be supported. Consult the factory if you need to broaden applications ratings.

Current Rating

Current ratings shown are DC values up to continuous steady state maximum ratings listed to the baseplate temperature for the grade level selected.

Power Dissipation (Pd) Ratings

Internal losses express the Pd rating of the device when operated at maximum currents and voltages listed. Pd in watts is dissipated exclusively by conduction to the filter baseplate and into the system heatsink.

Connecting the *3678 EMI filters

Good connection wiring practice will help maximize electro-magnetic compatibility with other system components:

- Dress filter input and return lines close to each other to reduce radiated emissions. Twisting leads is helpful.
- Dress filter output and return lines close to each other to reduce radiated emissions. Twisting leads is helpful.
- If possible, route conductors close to the system ground plane (in most cases, system chassis)
- Reduce coupling:
 - Keep LINE side and LOAD side conductors physically apart
 - Keep power and control signal conductors separated
 - Consider shielded conductors if necessary
 - Connect the chassis pin of *3678 EMI filter to a good chassis ground using a short, low inductance lead

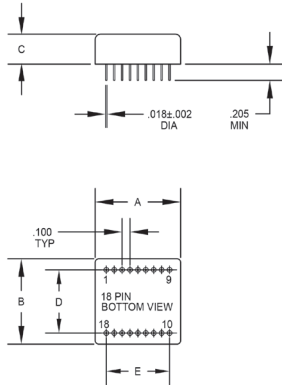
Parallel Connections for Higher Current Ratings

*3678 EMI Filters may be connected in parallel to gain higher overall current ratings; this is particularly useful in systems where multiple DC-DC converters are powered from the same input. Identical model *3678 filters must be selected and interconnecting wiring should be arranged to allow the filters to share the load current equally (e.g. interconnecting conductor circular/square mils should be as equal as practical on both the LINE and LOAD sides among the number of *3678 filters used). In such cases we recommend each filter be derated 10 percent for inevitable conductor imbalances.

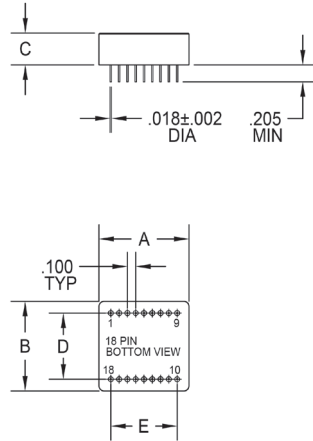
Grade Levels Available

Blank =	Industrial Grade Unit – Full power output from -55°C to +85°C case temp, linearly derates to zero at 115°C; 24 hour burn-in, 25°C test data only.
EU =	Engineering Unit – Full power output from -55°C to +85°C case temp, linearly derates to zero at 115°C; 24 hour burn-in, 25°C test data only. EU's are used for evaluation in lab or non-Flight applications.
M =	Military hardware with full power output from -55°C to +85°C case temp, linearly derates to zero at 115°C; 160 hour burn-in, -55°C, +25°C and +85°C test data.
E =	Military hardware with full power output from -55°C to +125°C case temp, linearly derates to zero at 135°C; 160 hour burn-in, -55°C, +25°C and +125°C test data.
L =	Space hardware 45 kRad with full power output from -55°C to +85°C case temp, linearly derates to zero at 115°C; 160 hour burn-in, -55°C, +25°C and +85°C test data.
LE=	Space hardware 45 kRad with full power output from -55°C to +125°C case temp, linearly derates to zero at 135°C; 160 hour burn-in, -55°C, +25°C and +125°C test data.
S =	Space hardware 100 kRad with full power output from -55°C to +85°C case temp, linearly derates to zero at 115°C; 320 hour burn-in, -55°C, +25°C and +85°C test data.
SE =	Space hardware 100 kRad with full power output from -55°C to +125°C case temp, linearly derates to zero at 135°C; 320 hour burn-in, -55°C, +25°C and +125°C test data.

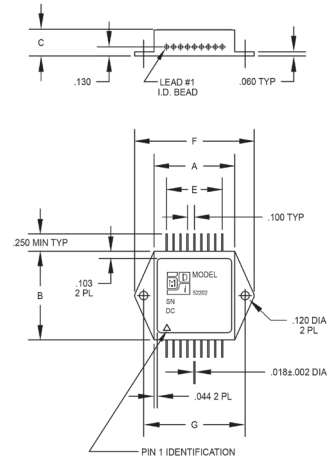
CASE STYLE 1



CASE STYLE 14



CASE STYLE 15



**Case Style 1 and 14
Connections *3678**

Pin No.	Designation
1	LINE In +
2	LINE In +
3	LINE In +
4	Chassis
5	LINE In +
6	LINE In Rtn
7	LINE In Rtn
8	LINE In Rtn
9	LINE In Rtn
10	LOAD Out Rtn
11	LOAD Out Rtn
12	LOAD Out Rtn
13	LOAD Out Rtn
14	Not Connected
15	LOAD Out +
16	LOAD Out +
17	LOAD Out +
18	LOAD Out +

**Case Style 15
Connections *3678**

Pin No.	Designation
1	LINE In +
2	LINE In +
3	LINE In +
4	LINE In +
5	Chassis
6	LINE In Rtn
7	LINE In Rtn
8	LINE In Rtn
9	LINE In Rtn
10	LOAD Out Rtn
11	LOAD Out Rtn
12	LOAD Out Rtn
13	LOAD Out Rtn
14	Not Connected
15	LOAD Out +
16	LOAD Out +
17	LOAD Out +
18	LOAD Out +

Where:

- LINE pins connect to the source power + and RTN
- LOAD pins connect to the DC-DC converter(s) + and RTN
- Chassis pin connects to the source GND and to the DC-DC converter(s) chassis pin(s)

Model No.	Case Style	Pin Count	Mounting
*3678	1	18	Solder Sealed Flangless PCB Mount
*3678 D	14	18	Seam Weld Flangless PCD Mount
*3678 TF	15	18	Seam Weld Chassis Mount with Flange

Case Dimensions

Units: inches | millimeters

Case Style	A	B	C	D	E	F	G
1	1.080 27.432	1.080 27.432	0.380 9.652	0.800 20.320	0.800 20.320	— —	— —
14 D	1.090 27.686	1.090 27.686	0.380 9.652	0.800 20.320	0.800 20.320	— —	— —
15 TF	1.160 29.464	1.283 32.588	0.380 9.652	— —	0.800 20.320	1.754 44.552	1.460 37.084

TOLERANCES: Drawings in Inches. All dimensions ±0.01 except F = max, C = +0.01/-0.020. For Custom Packages, Contact MDI Engineering



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