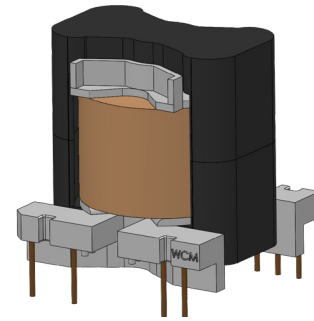


# WCM420-40 WCM420-20 WCM420-30 WCM420-10

## Switch Mode Transformers

### Product Description

This new series was designed for applications where board space is at a minimum. Featuring a finite element optimized core geometry to equalize flux distribution throughout the core cross section, the WCM420-10, -20, -30 and -40 core and bobbin sets feature outstanding power density at power levels up to 5 kW. This series is also available with two core material options, one for traditional SMPS frequencies up to 500 kHz and a new low permeability MnZn material with very low loss at frequencies over 500 kHz. As usual with WCM geometries, standoff between core and bobbin has creepage and clearance values which will meet the most stringent medical device standards.



### Output Power vs Frequency of Operation (Watts)

Product Code	Frequency	100 kHz	200 kHz	400 kHz	600 kHz	1 MHz
WCM420-40	Power Rating	2700	3400	4000	4700	5600
WCM420-30	Power Rating	1800	2400	2800	3300	4000
WCM420-20	Power Rating	1200	1800	2200	2600	3000
WCM420-10	Power Rating	500	660	850	1100	1500

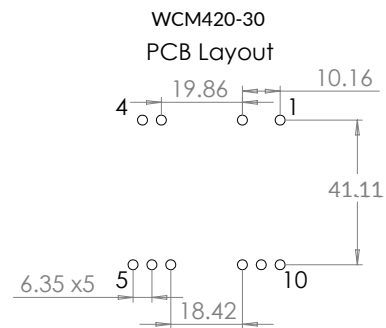
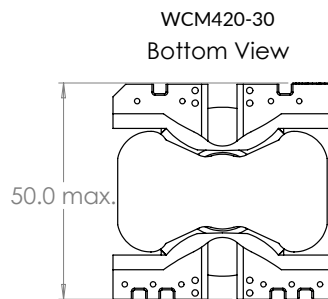
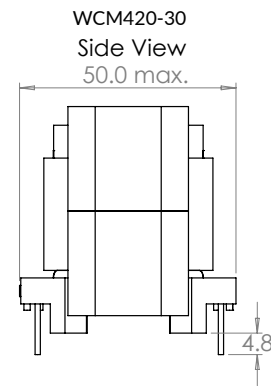
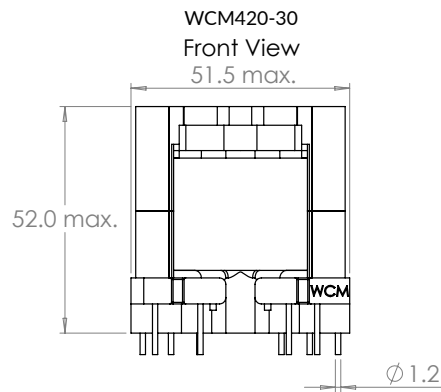
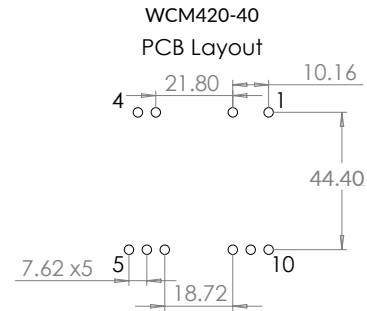
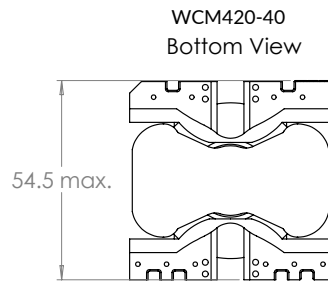
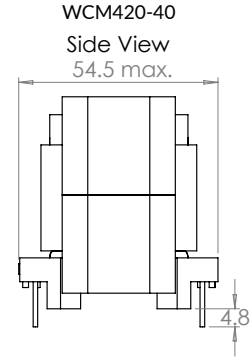
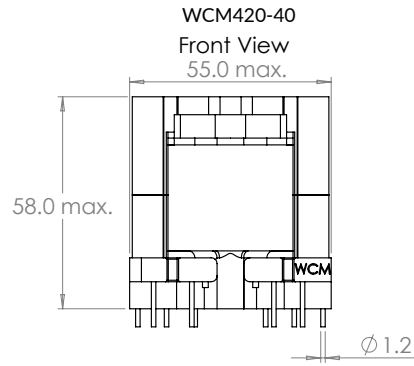
### Engineering Data

Product Code	AL (nH/N <sup>2</sup> )	Ae Core Area (mm <sup>2</sup> )	Le magnetic path length (mm)	Ve core volume (mm <sup>3</sup> )	Wa bobbin winding area (mm <sup>2</sup> )	WaAc Core area winding area (mm <sup>4</sup> )	Bobbin window width (mm)	Bobbin window height (mm)	Mean length per turn (mm)	Core material 25KHZ to 500KHZ	Core material 500KHZ to 1000KHZ
WCM420-40	10384	276.0	100.2	42335	269.2	74302	28.2	9.6	100.1	WCM-F200	WCM-FM400
WCM420-30	9329	223.2	90.2	30958	220.5	49224	25.2	8.8	91.7	WCM-F200	WCM-FM400
WCM420-20	8218	173.9	79.7	21285	169.3	29442	22.2	7.6	80.6	WCM-F200	WCM-FM400
WCM420-10	6414	107.7	63.3	10625	103.3	11123	17.5	5.9	63.8	WCM-F200	WCM-FM400



# Schematics

## WCM420-40 and WCM420-30



### Dimensions:

Inches  
mm

### Tolerance:

Inches

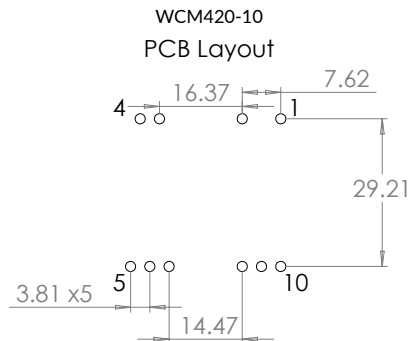
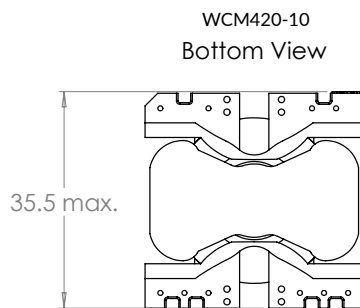
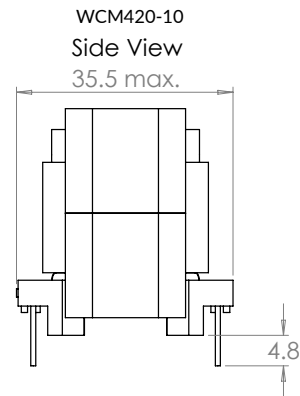
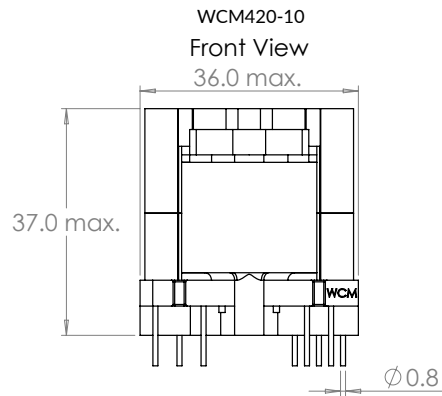
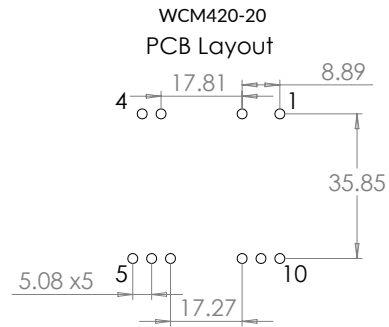
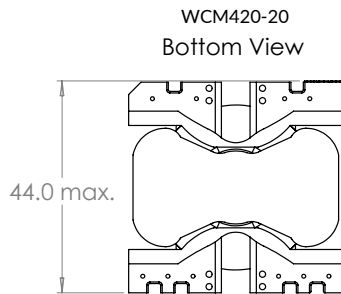
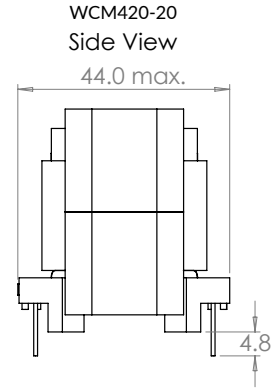
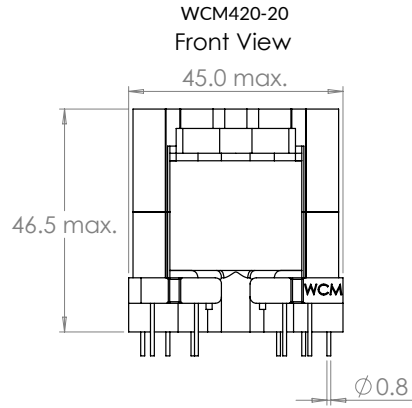
x.xx ± 0.020"  
x.xxx ± 0.005"

Millimeters

x.x ± 0.25mm  
x.xx ± 0.13mm

# Schematics

## WCM420-20 and WCM420-10



### Dimensions:

Inches  
mm

### Tolerance:

Inches

x.xx ± 0.020"  
x.xxx ± 0.005"

Millimeters

x.x ± 0.25mm  
x.xx ± 0.13mm

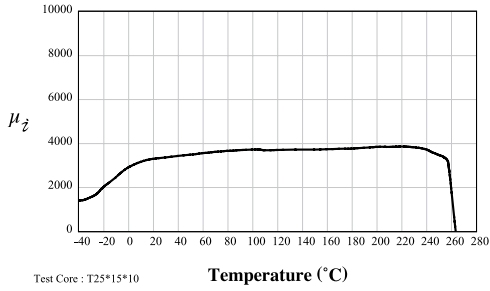
# Material Characteristics

## WCM-F200

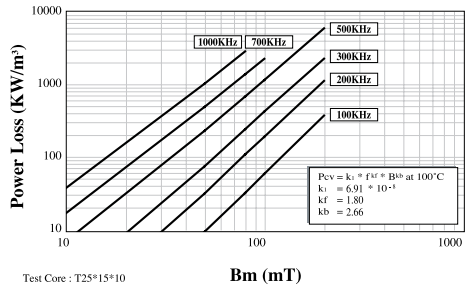
Characteristics	Symbol	Unit	Measuring Conditions		Low Loss Materials	
			Freq.	Flux den.	Temp.	P47
Initial Permeability	$\mu_i$	-			25 °C	3000 ±25%
Amplitude Permeability	$\mu_a$	-	25kHz	200mT	25 °C 100 °C	> 5000 > 5000
Power Loss	$P_v$	kw/m <sup>3</sup>	100kHz	200mT	25 °C 60 °C 100 °C 120 °C	430 390 360 380
Saturation Flux Density	$B_{ms}$	mT	10KHz	H = 1200A/m	25 °C 100 °C	520 420
Remanence	$B_{rms}$	mT	10KHz	H = 1200A/m	25 °C 100 °C	85 70
Coercivity	$H_c$	A/m	10KHz	H = 1200A/m	25 °C 100 °C	10 7
Hysteresis Material Constant	$\eta_B$	10 <sup>-6</sup> mT	10KHz	1.5-3.0mT	25 °C	<0.6
Disaccommodation Factor	DF	10 <sup>-6</sup>	10KHz	< 0.1mT	25 °C	<1
Curie Temperature	$T_c$	°C				>220
Resistivity	$\rho$	$\Omega m$				5.00
Density	$d$	g/cm <sup>3</sup>				4.90

Test core: OD=25mm TH=8mm ID=15mm

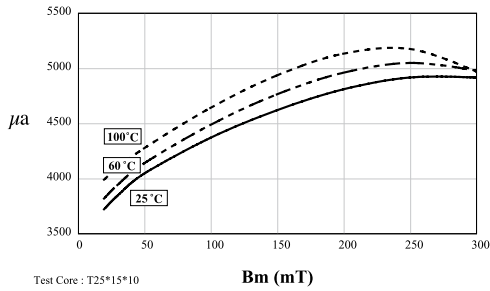
Initial Permeability V.S. Temperature



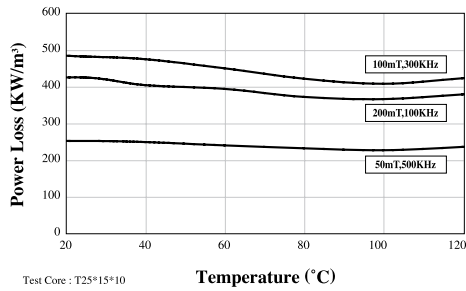
Power Loss V.S. Temperature/Flux Density/Frequency



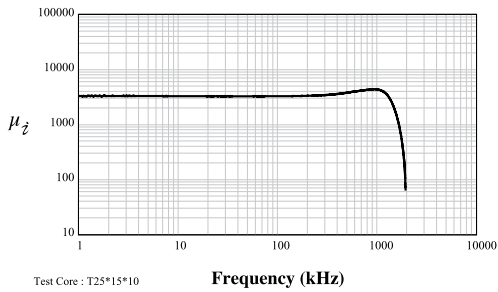
Amplitude Permeability V.S. Flux Density (Bm)



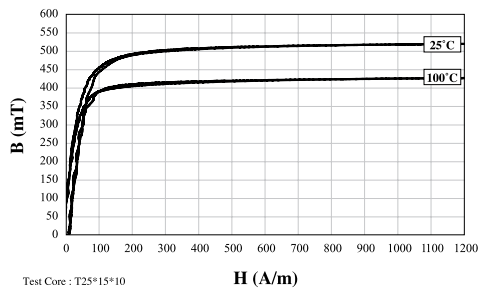
Power Loss V.S. Temperature



Initial Permeability V.S. Frequency



Saturation Flux Density V.S. Magnetic Field



# Material Characteristics

## WCM-FM400

Characteristics	Symbol	Unit	Measuring Conditions			Low Loss Materials
			Freq.	Flux den.	Temp.	P63
Initial Permeability	$\mu_i$	-	$\leq 10\text{kHz}$	0.25mT	25°C	900 $\pm 25\%$
Amplitude Permeability	$\mu_a$	-	25kHz	200mT	25°C 100 °C	> 1700 > 1800
Power Loss	Pv	kw/m <sup>3</sup>	100kHz	50mT	25°C 100 °C	80 80
				80mT	25°C 100 °C	1600 2000
				10mT	25°C 100 °C	20 20
				30mT	25°C 100 °C	200 250
				90mT	25°C 100 °C	80 80
				Saturation Flux Density	Bms	mT
Remanence	Brms	mT	10KHz	H = 1200A/m	25 °C 100 °C	205 115
Coercivity	Hc	A/m	10KHz	H = 1200A/m	25 °C 100 °C	50 40
Hysteresis Material Constant	$\eta_B$	10 <sup>-6</sup> mT	10KHz	1.5-3.0mT	25 °C	<1
Disaccommodation Factor	DF	10 <sup>-6</sup>	10KHz	< 0.25mT	25 °C	<2
Curie Temperature	Tc	°C				$\geq 280$
Resistivity	$\rho$	$\Omega\text{m}$				10.00
Density	d	g/cm <sup>3</sup>				4.80

Test core: OD=25mm TH=8mm ID=15mm

	Symbol	Unit	Measuring Conditions			High Frequency Low Loss Material
			Freq.	Flux den.	Temp.	P63
Initial Permeability	$\mu_i$		$\leq 10$ kHz	0.25mT	25°C	900 $\pm$ 25%
Amplitude Permeability	$\mu_a$		25kHz	200mT	25°C	> 1700
Power Loss	$P_v$	KW/m <sup>3</sup>	1MHz	50mT	25°C	80
					100°C	80
			2MHz	80mT	25°C	1600
					100°C	2000
			3MHz	10mT	25°C	20
					100°C	20
			3MHz	30mT	25°C	200
100°C	250					
5MHz	9mT	25°C	80			
		100°C	80			
Saturation Flux Density	$B_s$	mT	10kHz	H = 1200A/m	25°C	540
Remanence	$B_r$	mT	10kHz	H = 1200A/m	25°C	205
					100°C	115
Coercivity	$H_c$	A/m	10kHz	H = 1200A/m	100°C	50
Hysteresis Material Constant	$\eta_b$	10 <sup>-9</sup> /mT	10kHz	1.5-3.0mT	25°C	< 1
					100°C	40
Disaccommodation Factor	$D_s$	10 <sup>-6</sup>	10kHz	< 0.25 mT	25°C	< 2
Curie Temperature	$T_c$	°C				$\geq 280$
Resistivity	$\rho$	$\Omega$ m				10.00
Density	$d$	g/cm <sup>3</sup>				4.80

Note: Material characteristics are typical for a toroid core.  
Product specification will differ from these data due to the influence of geometry and size.

