

PM-CIXX CURRENT SENSE INDUCTORS

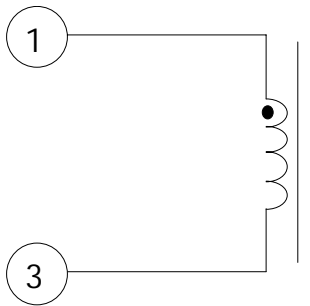
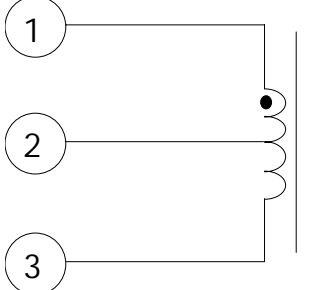
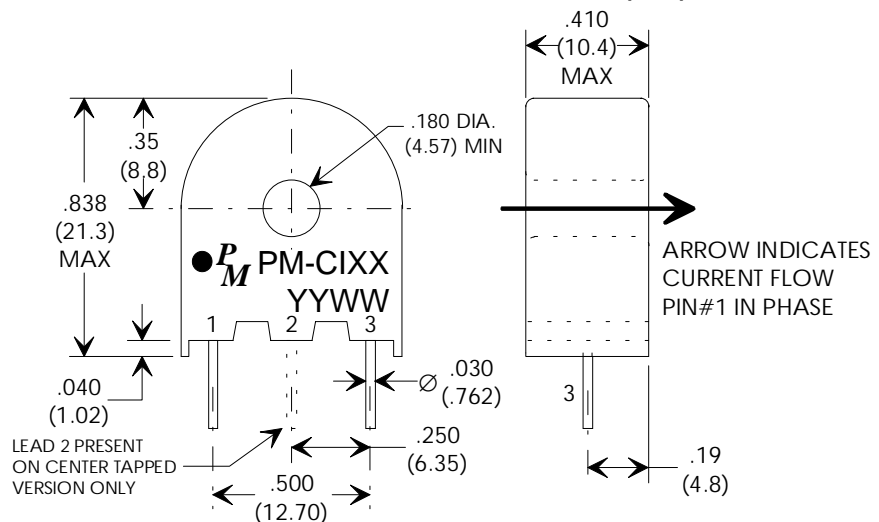
- ① Designed for Switch Mode Power Supply Applications
- ② Frequency Range from 10KHz to 200KHz
- ③ Fully Encapsulated Construction
- ④ Tapped and Untapped Versions
- ⑤ 2500Vrms Minimum Isolation Voltage
- ⑥ Center Hole for Primary Lead

ELECTRICAL SPECIFICATIONS AT 25°C - OPERATING TEMPERATURE RANGE -40°C TO +80°C

CONTROL VALUES			REFERENCE VALUES				CALC. VALUES		SCHEMATIC	
PART NUMBER	URNS $N_s + 1\%$	INDUCTANCE L_s (mH Min.)	DCR R_s (Ohms Max.)	I_{pk} (Amps)	R_T (Ohms)	K_v (Volt/Amp)	DROOP (%)	FLUX FACTOR K_B		LOSS FACTOR K_L
PM-CI01	50	5.0	0.70	35	15	0.30	2.4	273.97×10^3	3.31×10^{-9}	A
PM-CI02	100	20.0	1.40	50	50	0.50	2.0	68.49×10^3	3.33×10^{-9}	A
PM-CI03	200	80.0	4.50	50	200	1.00	2.0	17.12×10^3	3.35×10^{-9}	A
PM-CI04	300	180.0	9.00	75	300	1.00	1.4	7.61×10^3	3.37×10^{-9}	A
PM-CI05	50ct	5.0	0.70	35	15	0.30	2.4	273.97×10^3	3.31×10^{-9}	B
PM-CI06	100ct	20.0	1.40	50	50	0.50	2.0	68.49×10^3	3.33×10^{-9}	B
PM-CI07	200ct	80.0	4.50	50	200	1.00	2.0	17.12×10^3	3.35×10^{-9}	B
PM-CI08	300ct	180.0	9.00	75	300	1.00	1.4	7.61×10^3	3.37×10^{-9}	B

REFER TO CALCULATION EXAMPLE FOR PM-CIXX SERIES ON PAGE 2 OF THIS DATA SHEET.

- 1) REFERENCE VALUES ARE FOR UNIPOLAR OPERATION @ 50KHz, 40% DUTY CYCLE ($D_{max} = .40$).
- 2) THE MAXIMUM USABLE PEAK SENSE CURRENT (I_{pk}) IS DEPENDENT ON CORE SATURATION FACTORS AND SHOULD BE EVALUATED FOR THE ACTUAL OPERATING CONDITIONS. SEE APPLICATION DATA AND EXAMPLE ON PAGE 51.
- 3) THE MAXIMUM RECOMMENDED OPERATING FLUX DENSITY (B_{op}) @ AN OPERATING TEMPERATURE OF 105°C IS 2000 GAUSS.
- 4) THE TERM. RESISTOR (R_T) CAN BE VARIED TO ADJUST THE OPERATING FLUX DENSITY (B_{op}), DROOP, AND SCALE FACTOR (K_v).
- 5) THE SCALE FACTOR (K_v) IS PROPORTIONAL TO THE TERMINATING RESISTOR (R_T) AND IS EQUAL TO 1VOLT/AMP WHEN $R_T = N_s$
- 6) SECONDARY INDUCTANCE IS MEASURED AT 20KHz, 1.0VRMS.

SCHEMATIC
MECHANICAL
SCHEMATIC "A"

SCHEMATIC "B"

PHYSICAL Dimensions in inches (mm)


Specifications subject to change without notice.

pmci 4/97



APPLICATION EXAMPLE

APPLICATION EXAMPLE

GIVEN:

Part# = PM-CI02

Peak Current (I_{PK}) = 30.0 Amps

Terminating Resistor (R_T) = 100 Ohms

Operating Frequency (f) = 100KHz

Duty Cycle (Dmax) = .40 (40% on time)

CALCULATE OPERATING FLUX DENSISTY

From the Table the FLUX FACTOR is:

$$K_B = 68.49 \times 10^3$$

Flux Utilization Constant (K_F) is:

1.0 For Unipolar Operation

2.0 For Bipolar Operation

THEN:

$$B_{OP} = K_B \times I_{PK} \times R_T \times (D_{max} / K_F \times f)$$

$$= 68.49 \times 10^3 \times 30 \times 100 \times (.4 / 1 \times 100 \times 10^3)$$

$$= 822 \text{ gauss (OK less than 2000 gauss)}$$

CALCULATE PULSE DROOP

From the Table the Secondary Inductance is:

$$L_S = 20\text{mHy Minimum}$$

Note: The actual droop is dependent on the actual L_S in the circuits enviornment.

$$\text{Droop Exponent (D)} = R_T \times D_{max} / (L_S \times f)$$

$$= 100 \times .4 / (20 \times 10^{-3} \times 100 \times 10^3)$$

$$= 0.020$$

THEN:

$$\%_{\text{Droop}} = (1 - e^{-D}) \times 100$$

$$= 1.98 \%$$

OK less than 10%

(Depending on the application

Droop to 20% may be acceptable)

CALCULATE THE SCALE FACTOR

From the Table the Secondary Turns are:

$$N_S = 100$$

THEN:

$$K_V = R_T / N_S$$

$$= 100 / 100$$

$$= 1 \text{ volt/amp}$$

ESTIMATE ERROR DUE TO LOSSES

From the Table the Secondary DCR is:

$$R_S = 1.40 \text{ Ohms Maximum}$$

From the Table the approximate Loss Factor is:

$$K_L = 3.33 \times 10^{-9}$$

Note: The loss factor (K_L) is valid approximation from 10KHz to 200KHz

Secondary Copper Losses are:

$$P_{\text{loss}_S} = (I_{PK} / N_S)^2 \times R_S$$

$$= (30/100)^2 \times 1.40$$

$$= 0.126 \text{ Watt}$$

Core losses are:

$$P_{\text{loss}_C} = K_L^2 \times f^{1.621} \times B_{OP}^{2.569}$$

$$= (3.33 \times 10^{-9})^2 \times (100 \times 10^3)^{1.621} \times 822^{2.569}$$

$$= 0.0435 \text{ Watt}$$

Output Power is:

$$P_{\text{out}_S} = (I_{PK} / N_S)^2 \times R_T$$

$$= (30/100)^2 \times 100$$

$$= 9.00 \text{ Watt}$$

THEN:

$$\%_{\text{Error}} = [(P_{\text{loss}_S} + P_{\text{loss}_C}) / P_{\text{out}}] \times 100$$

$$= [(.126 + .0435) / 9] \times 100$$

$$= 1.88 \%$$