Premier Magnetics Inc.

"INNOVATORS IN MAGNETICS TECHNOLOGY"

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

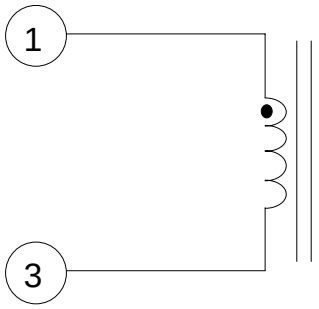
CONTROL VALUES				REFERENCE VALUES				CALC. VALUES		
PART NUMBER	TURNS N_S +1%	INDUCTANCE L_S (mH Min.)	DCR R_S (Ohms Max.)	I_{PK} (Amps)	R_T (Ohms)	K_V (Volt/Amp)	DROOP (%)	FLUX FACTOR K_B	LOSS FACTOR K_L	SCHEMATIC
PM-CI01	50	5.0	0.70	35	15	0.30	2.4	$273.97x10^{3}$	$3.31x10^{-9}$	A
PM-CI02	100	20.0	1.40	50	50	0.50	2.0	$68.49x10^{3}$	$3.33x10^{-9}$	A
PM-CI03	200	80.0	4.50	50	200	1.00	2.0	$17.12x10^{3}$	$3.35x10^{-9}$	A
PM-CI04	300	180.0	9.00	75	300	1.00	1.4	$7.61x10^{3}$	$3.37x10^{-9}$	A
PM-CI05	50ct	5.0	0.70	35	15	0.30	2.4	$273.97x10^{3}$	$3.31x10^{-9}$	B
PM-CI06	100ct	20.0	1.40	50	50	0.50	2.0	$68.49x10^{3}$	$3.33x10^{-9}$	B
PM-CI07	200ct	80.0	4.50	50	200	1.00	2.0	$17.12x10^{3}$	$3.35x10^{-9}$	B
PM-CI08	300ct	180.0	9.00	75	300	1.00	1.4	$7.61x10^{3}$	$3.37x10^{-9}$	B

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

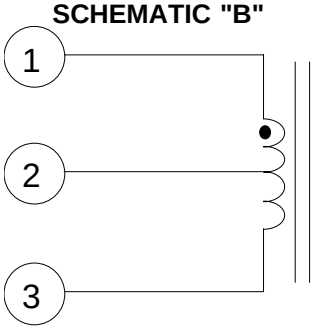
1) REFERENCE VALUES ARE FOR UNIPOLAR OPERATION @ 50KHz, 40% DUTY CYCLE (Dmax = .40).
2) THE MAXIMUM USABLE PEAK SENSE CURRENT (I_{pk}) IS DEPENDENT ON CORE SATURATION FACTORS AND SHOULD BE EVALUATED FOR THE ACTUAL OPERATING CONDITIONS. SEE APPLICATION DATA AND EXAMPLE ON PAGE 51.
3) THE MAXIMUM RECOMMENDED 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

SCHEMATIC "A"

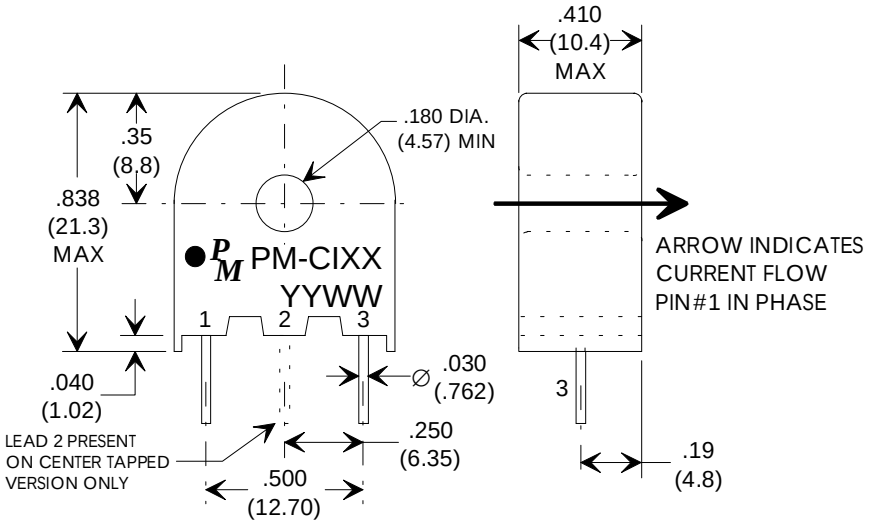


SCHEMATIC "B"



MECHANICAL

PHYSICAL Dimensions in inches (mm)



Specifications subject to change without notice.

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

$= 68.49x10^3 \times 30 \times 100 \times (.4 / 1 \times 100x10^3)$

= 822 gauss (OK less than 2000 gauss)

CALCULATE PULSE DROOP

From the Table the Secondary Inductance is:
L_S = 20mHy Minimum

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

Droop Exponent (D) $= R_T \times Dmax / (L_S \times f)$

$= 100 \times .4 / (20x10^{-3} \times 100x10^3)$

= 0.020

THEN:
$\%\_Droop = (1-e^{-D}) \times 100$

= 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 volt/amp

ESTIMATE ERROR DUE TO LOSSES

From the Table the Secondary DCR is:
R_S = 1.40 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 from10KHz to 200KHz

Secondary Copper Losses are:
$P\_loss_S = (I_{PK} / N_S)^2 \times R_S$

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

= 0.126 Watt

Core losses are:
$P\_loss_C = K_L^2 \times f^{1.621} \times B_{OP}^{2.569}$

$= (3.33x10^{-9})^2 \times (100x10^3)^{1.621} \times 822^{2.569}$

= 0.0435 Watt

Output Power is:

$P\_out_S = (I_{PK} / N_S)^2 \times R_T$

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

= 9.00 Watt

THEN:
$\%\_Error = [(P\_loss_S + P\_loss_C) / P\_out] \times 100$

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

= 1.88 %

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