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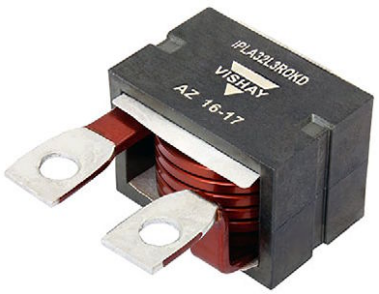
High Current Planar Choke Inductor



In addition to catalogue product presented here, many custom products have been engineered see on following page few examples.

FEATURES

- For high power density DC/DC converter application
- High current capabilities
- Very stable performances versus temperature
- Very compact design (low profile and weight)
- Low EMI, magnetically shielded
- High self-resonance frequency
- Recommended frequency range (100 kHz; 800 kHz)
- Operating temperature range:
  -55 °C; 125 °C with heatsink dissipation
- Flexible pin out design (tapped output terminals, layout, …)
- Material temperature grade: 180 °C
- Custom design on request

DESIGN SUPPORT TOOLS click logo to get started

3D Models Available

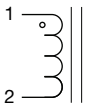
QUICK REFERENCE DATA	
Type	Inductor
Size (L x W x H)	31 mm x 43 mm x 22.2 mm
Terminals	Leadframe or wires
Inductance range (1)	1 µH to 4 µH (2)
Frequency range	100 kHz to 800 kHz

Notes

(1) Other values on request

(2) Please refer to “part number examples” table on the next page

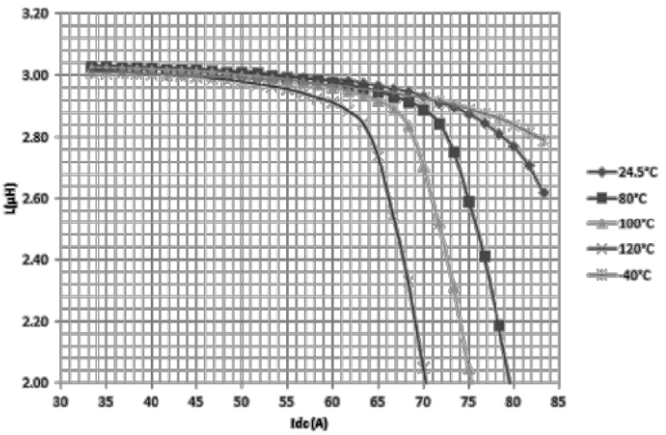
CLASSICAL FRAMEWORKS - Other topologies on request

L(1-2) 100 kH / 0.1 V	WINDING R_{DC} (1-2)	INSULATION: WINDING / CORE 500 V_{DC}	POWER LOSSES ASSESSMENT UNDER 70 A_{DC} AND WINDING AT 120 °C	ELECTRICAL SCHEME
3 µH ± 10 %	0.62 mΩ	R_i > 10 MΩ	3 W (1)	

Note

(1) **Caution:** power losses draining shall be managed by customer device

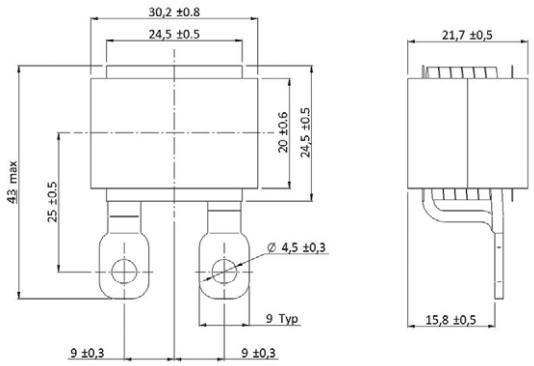
ELECTRICAL SCHEMES



TYPICAL THERMAL RESISTANCE

NATURAL CONVECTION	HEATSINK 1 FACE	HEATSINK 2 FACES
10.5 W/mK	4 W/mK	2 W/mK

MECHANICAL DIMENSIONS FOR IPLA32L (lead frames with smooth holes)



Note

- Standard model: lead frame with holes (not threaded)

PART NUMBER EXAMPLES

PART NUMBER	L (µH)	*I* (A)	Δ*I* (A)	LOSS (W)	ΔT [1] (°C)
IPLA32L1R0KD	1	110	22	7	75
IPLA32L2R0KD	2	100	20	5.8	60
IPLA32L3R0KD	3	70	14	2.8	30
IPLA32L4R0KD	4	50	10	1.5	15

Note

[1] ΔT °C assessed with natural convection. When ΔT °C > 40 °C it's advised to use a fitted thermal device to keep core temperature ≤ 125 °C

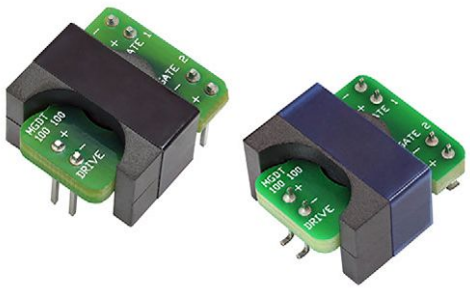
EXAMPLES OF CUSTOM DESIGNS ALREADY ENGINEERED

Custom IPLA 32L (no holes in lead frame)	Custom IPLA 32L (special lead frame shapes)	IPLA 32N (threaded holes in lead frames)
		
3 µH / 45 A	3 µH / 70 A	3 µH / 140 A

SAP PART NUMBERING

MODEL	SIZE	STYLE	VALUE	RATIO	SPECIAL
4 digits **IPLA**	2 digits **32** = EC 32	1 digit **W** = wire **L** = leadframe **N** = leadframe with threaded nuts	3 digits **3R0** = 3 µH **101** = 100 µH **300** = 30 µH	1 digit **M** = ± 20 % **A** = ± 15 % **K** = ± 10 %	6 digits

Miniaturized Gate Drive Planar Transformers



FEATURES

RoHS* Available

- Deliver MOSFET / IGBT gate power and timing signals simultaneously
- Directly drive high side MOSFETs / IGBTs on busses up to 1200 V
- Excellent rise time, overshoot, and peak current characteristics
- 8 mm minimum creepage and clearance from drive to gates
- Low profile planar package
- LF and SM versions are RoHS-compliant

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

ABSOLUTE MAXIMUM RATINGS			
PARAMETER	**CONDITIONS**	**LIMITS**	**UNITS**
Dielectric withstand voltage	Drive to gate, 1 min	3750	V_{AC}
	Gate to gate, 1 min	2500	V_{AC}
Total power dissipation (1)	T_A = 25 °C	2.0	W
Operating temperature (2)	Continuous	-55 to +125	°C
Storage temperature	Continuous	-55 to +130	°C
Frequency		100 to 500	kHz
Size (L x W x H)		20.57 x 18.42 x 11.43	mm
Terminals	Through-hole and surface-mount		

Note

(1) Derate at 33.3 mW/°C above 25 °C

(2) Derate drive level to 60 V/µs above 85°C

STANDARD ELECTRICAL SPECIFICATIONS									
PART NUMBER	**USEFUL FREQ. RANGE (kHz)**	**TRANSFER RATIO (± 3 %) (1)**	**DRIVE EXCITATION MAX. (Vµs)**	**MAGNETIZING INDUCTANCE MIN. (µH) (2)(3)**	**LEAKAGE INDUCTANCE MAX. (µH) (4)**	**DC RESISTANCE (2)**		**INTERWINDING CAPACITANCE**	
						DRIVE MAX. (Ω)	**GATES MAX. (Ω)**	**DRIVE TO GATE MAX. (pF)**	**GATE TO GATE MAX. (pF)**
MGDT100100	100 to 500	1 : 1 : 1	80	240	0.5	0.35	0.35	15	10
MGDT100100LF	100 to 500	1 : 1 : 1	80	240	0.5	0.35	0.35	15	10
MGDT100100-SM	100 to 500	1 : 1 : 1	80	240	0.5	0.35	0.35	15	10
MGDT100125	100 to 500	1 : 1.25 : 1.25	80	240	0.5	0.35	0.50	25	10
MGDT100125LF	100 to 500	1 : 1.25 : 1.25	80	240	0.5	0.35	0.50	25	10
MGDT100125-SM	100 to 500	1 : 1.25 : 1.25	80	240	0.5	0.35	0.50	25	10

Notes

(1) Drive : gate : gate

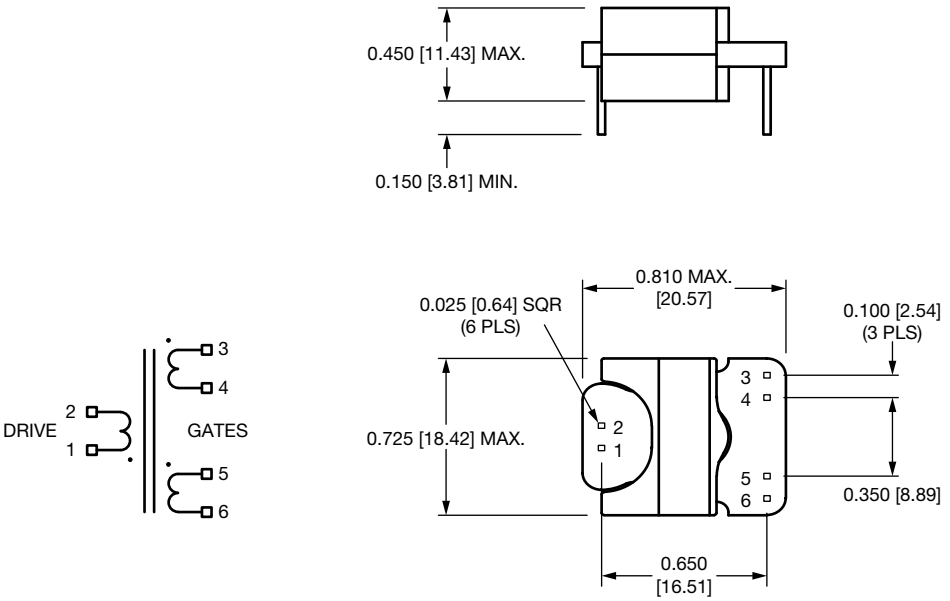
(2) T_A = 25 °C

(3) 100 mV at 100 kHz across the drive winding with all gates open

(4) 100 mA at 100 kHz into the drive winding with all gates shorted

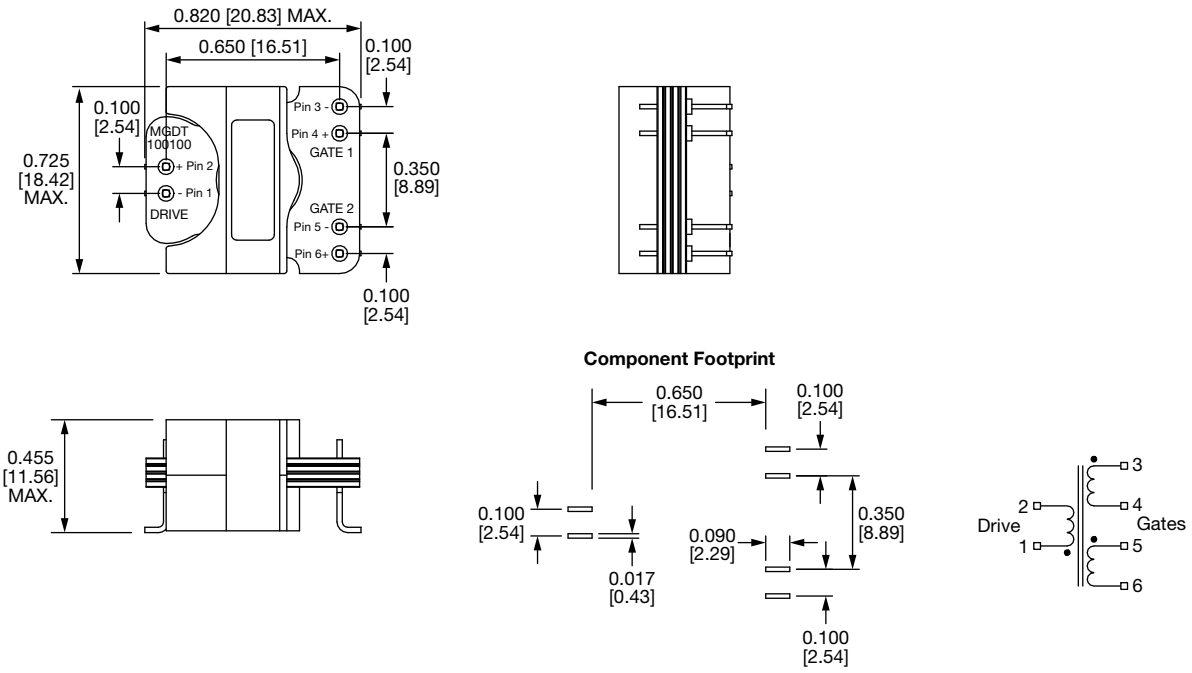
DIMENSIONS in inches [millimeters]

MGDT1001.., MGDT1001..LF

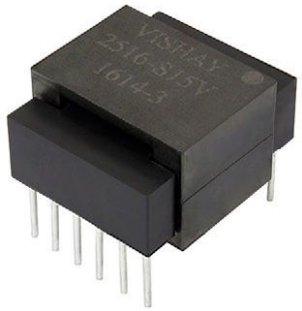


Tolerance on all dimensions is ± 0.010 [0.25] unless otherwise specified.

MGDT1001..-SM



Versatile Through-Hole Planar Transformers



FEATURES

- Higher power density levels versus traditional planar designs
- Designed to meet MIL-PRF-27 requirements
- Minimal board area footprint
- Easily customized to meet design-specific requirements
- Operating frequencies from 100 kHz to 500 kHz
- Split primary design to allow for efficient 120 V or 380 V operation
- Overmolded windings for ruggedized applications
- Minimal parasitic variation
- Operating temperature range -55 °C to +130 °C, power derating above 105 °C
- **Patent pending**

APPLICATIONS

- Off-line and PFC-derived switchmode power supplies
- Full-bridge / half-bridge converters from 150 W to 300 W
- Industrial control, and alternative energy applications
- Markets include avionics, industrial, military, and medical

ABSOLUTE MAXIMUM RATINGS			
PARAMETER	**CONDITIONS**	**LIMITS**	**UNITS**
Dielectric withstand voltage	Pri - sec, 5 s	1500	V_{AC}
	Sec - sec; 5 s	500	V_{AC}
Total power dissipation (1)	T_A = 105 °C	3	W
Power		150 to 300	W
Operating temperature	Continuous	-55 to +130	°C
Storage temperature	Continuous	-65 to +155	°C
Frequency		100 to 500	kHz
Size (L x W x H)		30 x 26 x 17	mm
Terminals	Through hole		

Note

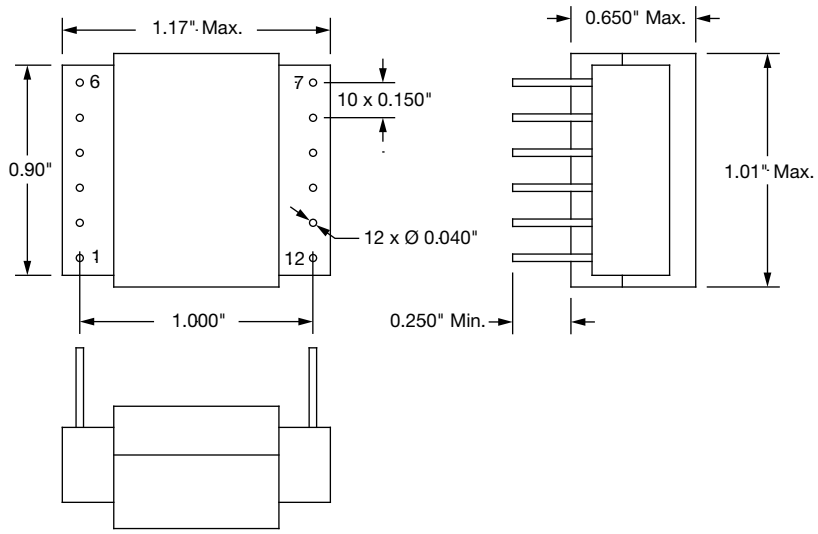
(1) Derate per the graph for temperatures above 105 °C

STANDARD ELECTRICAL SPECIFICATIONS									
PART NUMBER	**OUTPUT VOLTAGE (V)**	**MAGNETIZING INDUCTANCE MIN. (µH) (1)**	**LEAKAGE INDUCTANCE MAX. (µH) (2)**	**INTERWINDING CAPACITANCE MAX. (pF)**	**TRANSFER RATIO PRI : SEC**	**DCR (mΩ) (3)**			**RATED CURRENT (A) (4)**
						2.3 to 4.5	**12 to 8**	**11 to 7**	
MTPL-2516-S12V	12	450	1.70	120	0.176	23.0	8	8	22.0
MTPL-2516-S15V	15	450	2.00	120	0.214	28.0	12	12	16.25
MTPL-2516-S24V	24	450	1.30	120	0.333	23.0	25	25	12.5

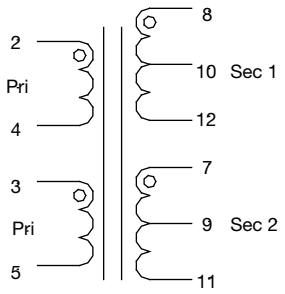
Notes

(1) 100 mV at 100 kHz, across 2.3 to 4.5
(2) 100 mV at 100 kHz across 2.3 to 4.5, short 7 through 12
(3) T_A = 25 °C
(4) Current rated for 40 °C temperature rise, secondaries in parallel

DIMENSIONS in inches



Schematic



For 90 V to 270 V operation tie 2.3 and 4.5.
For 380 V operation tie 3.4.

TEMPERATURE RISE VS. POWER DISSIPATION (W)

Low Power Planar Transformer 100 W to 500 W

PLA32 is highly versatile model as further detailed below

FEATURES

RoHS COMPLIANT

- Compact design with various configurations available upon request
- For high power density DC/DC converter application
- Very low profile and weight
- High efficiency: > 99 %
- Recommended frequency range: 50 kHz to 400 kHz
- Operating temperature range: -55 °C to 125 °C with heat sink dissipation
- Easy-assembly system for cold plates
- Material temperature grade: 180 °C

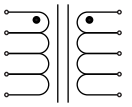
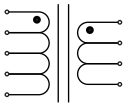
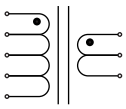
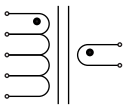
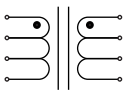
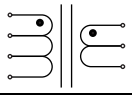
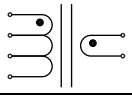
DESIGN SUPPORT TOOLS

click logo to get started

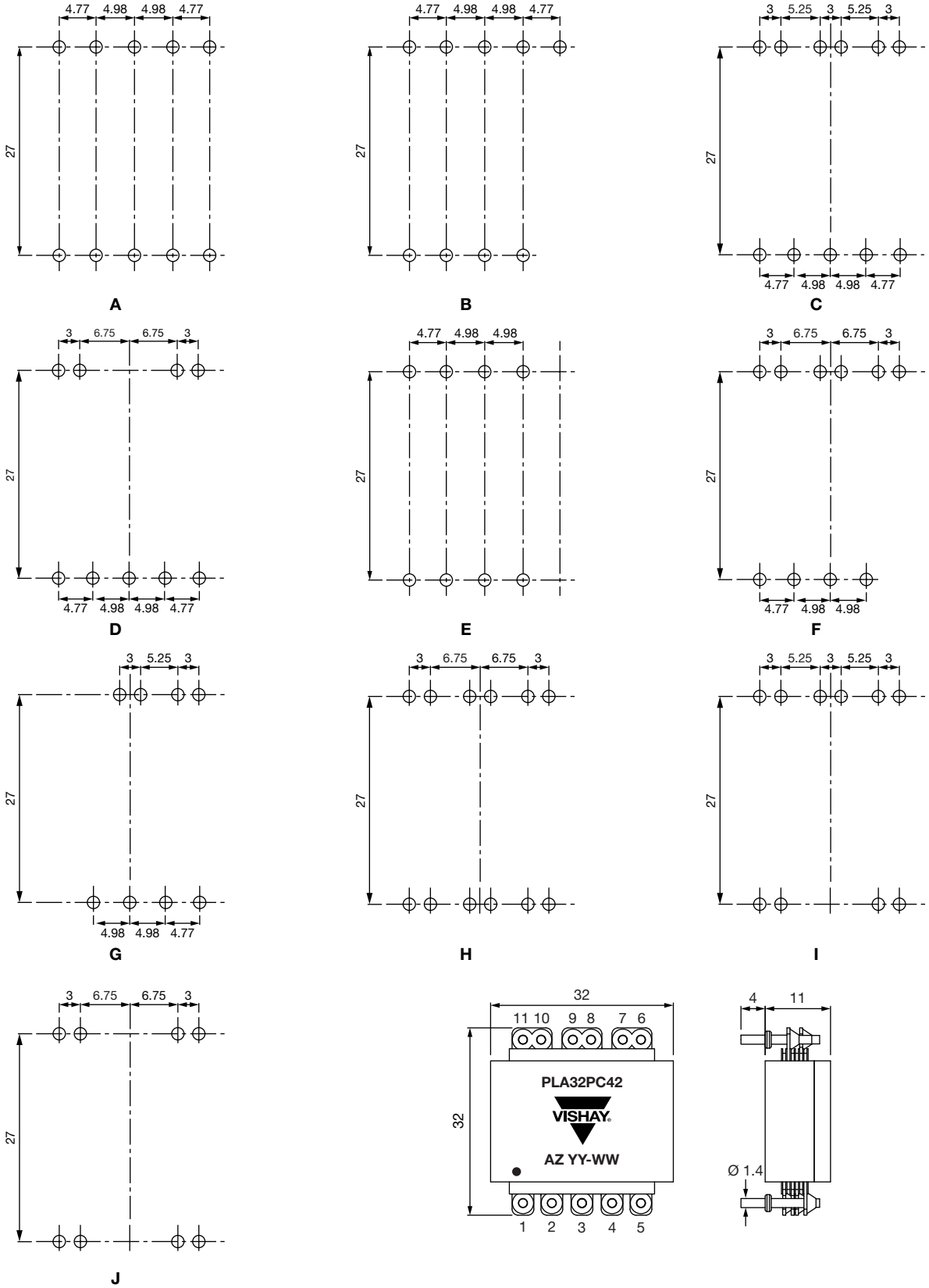
3D Models Available

QUICK REFERENCE DATA	
Type	Transformer
Size (L x W x H)	32 mm x 32 mm x 15 mm
Terminals	Through holes
Power	100 W to 500 W
Frequency range	50 kHz to 400 kHz
Inductance range	5.5 µH to 147.5 µH

CLASSICAL FRAMEWORKS - Other topologies on request

ELECTRICAL DIAGRAM	RATIO	LP (µH) ± 25 %	ET_sat ($V_{µs}$)	ET ($V_{µs}$) Core loss = 1 W 100 kHz	FOOTPRINT
	4 : 4	118	248	157.5	A
	4 : 3				B
	4 : 2				C
	4 : 1				D
	3 : 3	66.6	186	121	E
	3 : 2				F
	3 : 1				G
	2 : 2	29.6	124	80	H
	2 : 1				I
	1 : 1	7.4	62	40	J

FOOTPRINT

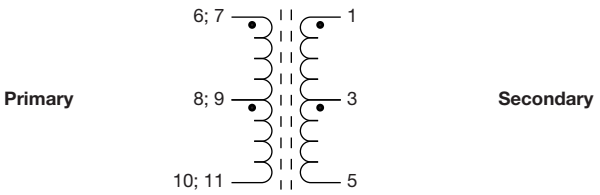

4.77 4.98 4.98 4.77
27
A
B
3 5.25 3 5.25 3
C
3 6.75 6.75 3
D
E
F
3 5.25 3
G
H
I
J
32
11 10 9 8 7 6
PLA32PC42
VISHAY
AZ YY-WW
1 2 3 4 5
4 11
Ø 1.4

EXAMPLE OF TRANSFORMER APPLICATION: 150 W PUSH-PULL DC/DC CONVERTER, PLA32PC42

POWER SUPPLY						
TOPOLOGY	FREQUENCY	POWER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	DUTY CYCLE MAX.
Push-pull	150 kHz	150 W	11 V_{DC} to 16 V_{DC}	6 V, 16 V	10.5 A	0.73

STANDARD ELECTRICAL CHARACTERISTICS						
INDUCTANCE (10 kHz; 0.1 V)	LEAKAGE INDUCTANCE (10 kHz; 0.1 V)	TURN RATIO	$R_{DC(1-3)}$ $R_{DC(3-5)}$ 20 °C	$R_{DC(6;\ 7-8;\ 9)}$ $R_{DC(8;\ 9-10;\ 11)}$ 20 °C	POWER LOSSES	HIPOT: PRIMARY / SECONDARY 1000 V_{AC}
7.4 µH ± 25 %	< 100 nH	1:2	1.2 mΩ	0.6 mΩ	< 1.6 W	< 150 µA

ELECTRICAL SCHEMES

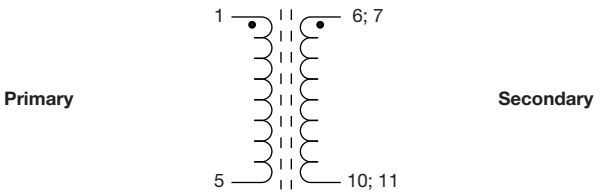


EXAMPLE OF TRANSFORMER APPLICATION: 300 W FULL-BRIDGE + CURRENT DOUBLER DC/DC CONVERTER, PLA32PD41

POWER SUPPLY						
TOPOLOGY	FREQUENCY	POWER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	DUTY CYCLE MAX.
Full-bridge + current doubler	200 kHz	300 W	30 V_{DC} to 70 V_{DC}	7 V	43 A	0.95

STANDARD ELECTRICAL CHARACTERISTICS						
INDUCTANCE (10 kHz; 0.1 V)	LEAKAGE INDUCTANCE (10 kHz; 0.1 V)	TURN RATIO	$R_{DC(1-5)}$	$R_{DC(6;\ 7-10;\ 11)}$	POWER LOSSES	HIPOT: PRIMARY / SECONDARY 1000 V_{AC}
118 µH ± 25 %	< 100 nH	4:1	2.4 mΩ	0.2 mΩ	< 2.2 W	< 150 µA

ELECTRICAL SCHEMES



RECOMMENDATIONS FOR MOUNTING

Announced performances are achieved using a liquid cooling system. The internal temperature must be maintain below 160 °C. The user shall correctly size its own heatsink according to real working conditions of his device.

PACKAGING

Individual box.

SAP PART NUMBERING					
MODEL	SIZE	STYLE	FOOTPRINT	RATIO	SPECIAL
PLA	32	P = PIN (through hole)	1 digit (see page 2)	11 = 1 : 1 to 44 = 4 : 4 SR = special ratio on request	6 digits (special code)

Medium Power Planar Transformer 1 kW to 3 kW

In addition to this standard design of PLA51 many custom designs can be offered upon request

LINKS TO ADDITIONAL RESOURCES

3D Models

FEATURES

RoHS COMPLIANT

- For high power density DC/DC converter application
- Very low profile and weight
- High efficiency: > 99 %
- Recommended frequency range (50 kHz; 400 kHz)
- Operating temperature range: -55 °C; 125 °C with heat sink dissipation
- Easy-assembly system for cold plates
- Tapped output terminals
- Material temperature grade: 180 °C
- Excellent repeatability

QUICK REFERENCE DATA	
Type	Transformer
Size (L x W x H)	70 mm x 53 mm x 22 mm
Terminals	Tapped outputs or wires
Power	1000 W to 3000 W
Frequency range	50 kHz to 400 kHz
Inductance range	96 µH to 160 µH

EXAMPLE OF TRANSFORMER APPLICATION: 2 kW DC/DC CONVERTER, PLA51LA32

POWER SUPPLY						
TOPOLOGY	**FREQUENCY**	**POWER**	**INPUT VOLTAGE**	**OUTPUT VOLTAGE**	**OUTPUT CURRENT**	**DUTY CYCLE MAX.**
Full bridge with current doubler	100 kHz	2 kW	50 V_{DC} to 110 V_{DC}	30 V	67 A	0.98

STANDARD ELECTRICAL CHARACTERISTICS						
INDUCTANCE (10 kHz; 0.1 V)	**LEAKAGE INDUCTANCE (10 kHz; 0.1 V)**	**TURN RATIO**	**POWER LOSSES**	**EFFICIENCY**	**HIPOT: PRIMARY / SECONDARY + CORE 1500 V_{AC}**	**HIPOT: SECONDARY / CORE**
128 µH ± 25 %	< 150 nH (typical)	3:2	< 17 W	> 99 %	< 150 µA	< 150 µA

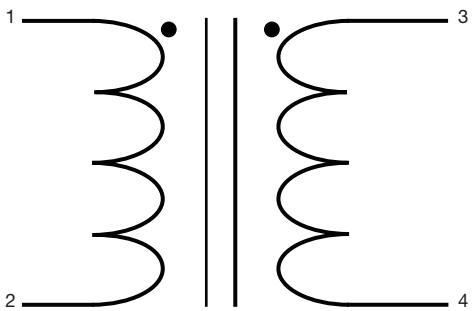
RECOMMENDATIONS FOR MOUNTING

Announced performances are achieved using a liquid cooling system. The internal temperature must be maintained below 160 °C. The user shall correctly size its own heatsink according to real working conditions of his device.

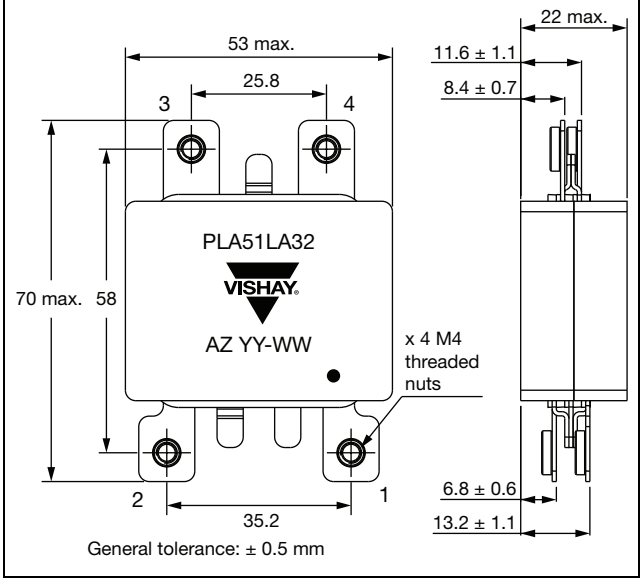
PACKAGING

Individual box.

ELECTRICAL SCHEMES



DIMENSIONS in millimeters (± 0.5)



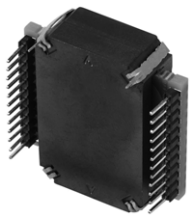
Notes

- Weight ≈ 170 g
- Take care of ferrite core while handling (no shock admitted)
- Terminal fixing: with M4 screw, max. tightening: 1.2 Nm

SAP PART NUMBERING

MODEL	SIZE	STYLE	FOOTPRINT	RATIO	SPECIAL
PLA	**51**	**L** = leadframe with nuts **W** = wires	**A** = as shown in above drawings (other upon request)	**21** = 2 : 1 (on request) **31** = 3 : 1 (on request) **32** = 3 : 2 **SR** = special ratio	**XXXXX** = special code (6 digits)

Versatile Planar Transformer



FEATURES

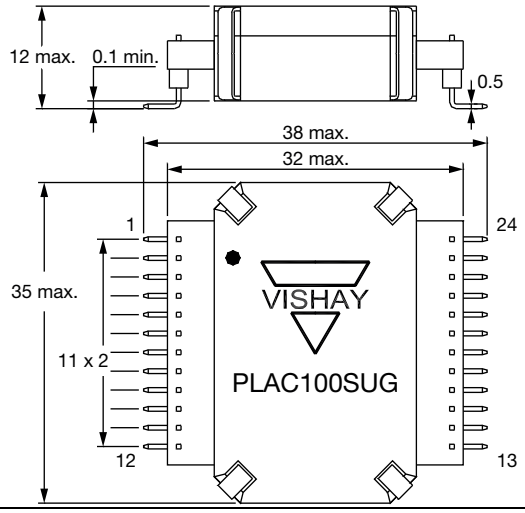
- Patent Nº 99 00241
- Designed for switch mode power supply applications (transformer and choke inductor)
- End user configures the transformer by using a software supplied
- Frequency range: 50 kHz to 400 kHz
- Suitable for surface mount or through hole
- UL 94 V-0 material
- High power up to 220 W
- Operating temperature: -55 °C to +125 °C

RoHS COMPLIANT

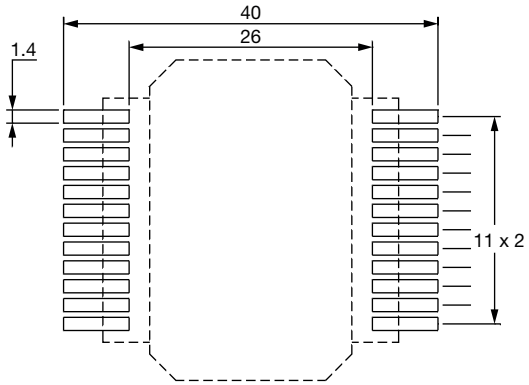
QUICK REFERENCE DATA	
Type	Transformer
Size (L x W x H)	40 mm x 35 mm x 12 mm
Terminals	SMD or through holes
Power	Up to 220 W
Frequency range	50 kHz to 400 kHz
Inductance range	5.2 µH to 4032 µH

DIMENSIONS in millimeters (± 0.5)

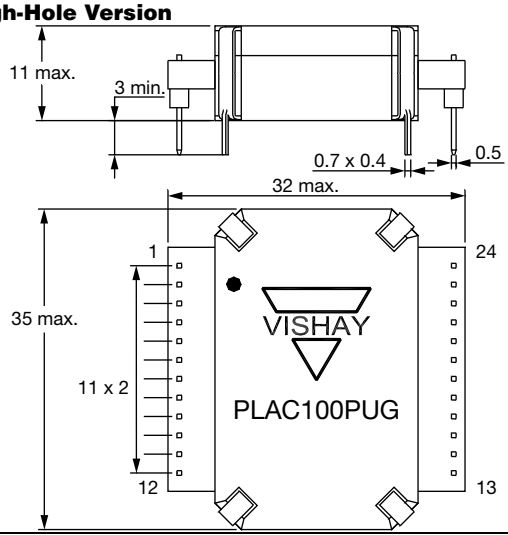
SMD Version



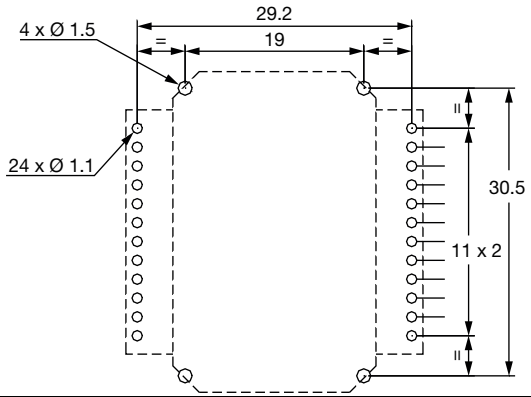
Recommended PCB Layout
Weight: 35 g



Through-Hole Version



Recommended PCB Layout
Weight: 35 g



APPLICATIONS: DC/DC POWER SUPPLY

- Switching mode power supplies
- DC/DC converters

TECHNOLOGY

PLAC 100 is a highly flexible planar transformer. Inhouse the design engineer can adapt the different combinations of serial and parallel configurations of the windings to give a substantial number of ratio and current possibilities via the supplied software.

The transformer is one of the first critical components in the design of power supply and converters. PLAC 100 allows a great versatility for many power supply topologies: forward, flyback, half-bridge, bridge ...

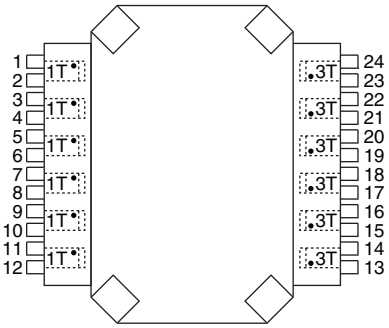
Thanks to this adaptability it enables user to reduce and optimize times during the development and the production of power supplies.

PRINCIPLE OF USE

Available windings:

- 6 windings with 1 turn
- 6 windings with 3 turns

The user determines their own configuration of the windings via the PCB layout - software provided PLAC 100 SOFT.



TECHNICAL DATA ALLOWING CONCEPTION

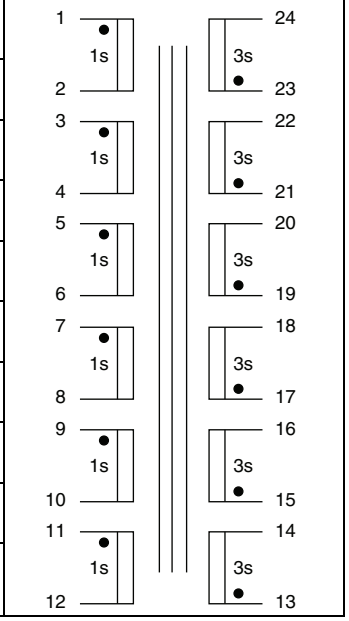
B_{sat}	Saturation flux density		< 300 mT à 100 °C
A_e	Effective cross-sectional area of a core		113 mm^2
V_e	Effective volume of a core		4234 mm^3
R_{th}	Thermal resistance		22 °C/W
P_c	Core power loss	f: 50 kHz to 200 kHz (excluded)	$P_c = 5.8 \times 10\text{-}6\ f_{(Hz)}^{1.51} \left(\frac{B\ (T)}{2}\right)^{2.94}$
		f: 200 kHz (included) to 400 kHz	$P_c = 11 \times 10\text{-}9\ f_{(Hz)}^{1.96} \left(\frac{B\ (T)}{2}\right)^{2.55}$
			f: Frequency; B: Peak-peak flux density

STANDARD ELECTRICAL SPECIFICATIONS

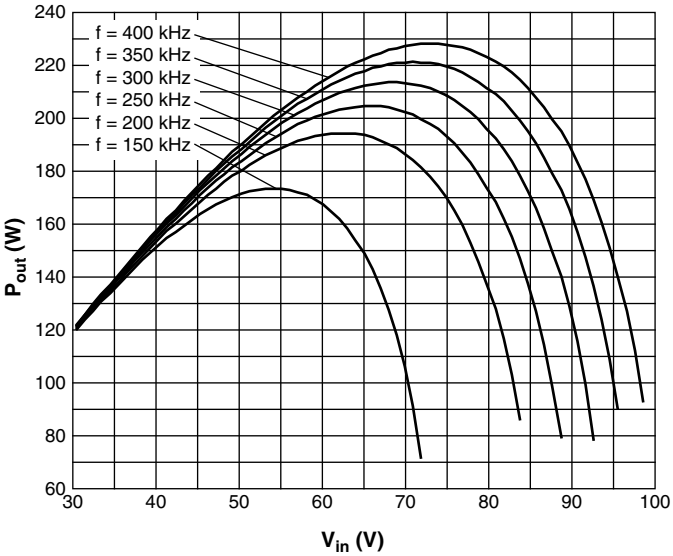
MODEL	INDUCTANCE µH	POWER RANGE W	FREQUENCY kHz	POWER SUPPLY TOPOLOGY
PLAC 100	7 to 63	up to 220	50 to 400	Flyback; forward; push-pull; bridge; half-bridge

ELECTRICAL CHARACTERISTICS at 25 °C

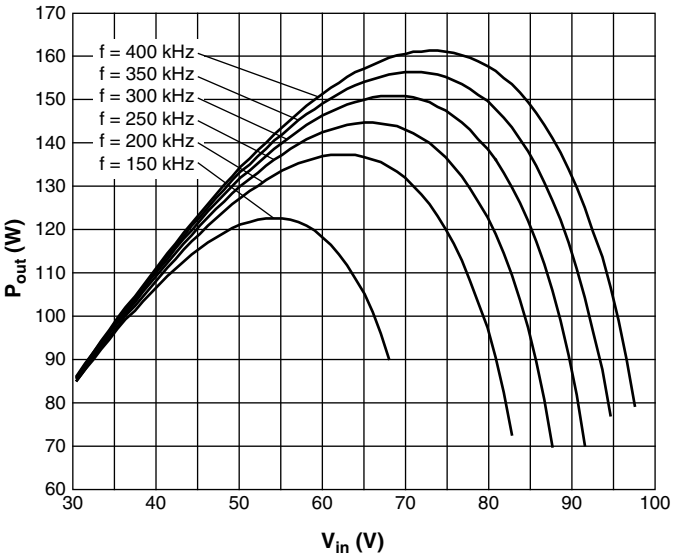
3 turn coil (13 to 24) Inductance without air gap (0.1 V, 10 kHz)	63 µH ± 25 %
1 turn coil (1 to 12) Inductance without air gap (0.1 V, 10 kHz)	7 µH ± 25 %
Al (nH) without air gap (UG)	7000
Al (nH) expendable	100; 160; 250; 400; 630
R_{DC} 1 turn coil (1 to 12) (typical value)	3 mΩ
R_{DC} 3 turn coil (13 to 24) (typical value)	35 mΩ
Hipot between 1 turn winding/3 turns winding with if < 100 µA	1000 V_{AC}
Hipot between 1 turn winding with if < 100 µA	300 V_{AC}
Hipot between 3 turn winding with if < 100 µA	300 V_{AC}
Hipot between winding and ground with if < 100 µA	800 V_{AC}



FORWARD: $P_{out\ max.}$; Duty cycle = 0.45



FLYBACK: $P_{out\ max.}$; Duty cycle = 0.45



MARKING

- Vishay trademark
- Part number
- Manufacturing date

TERMINALS FINISH

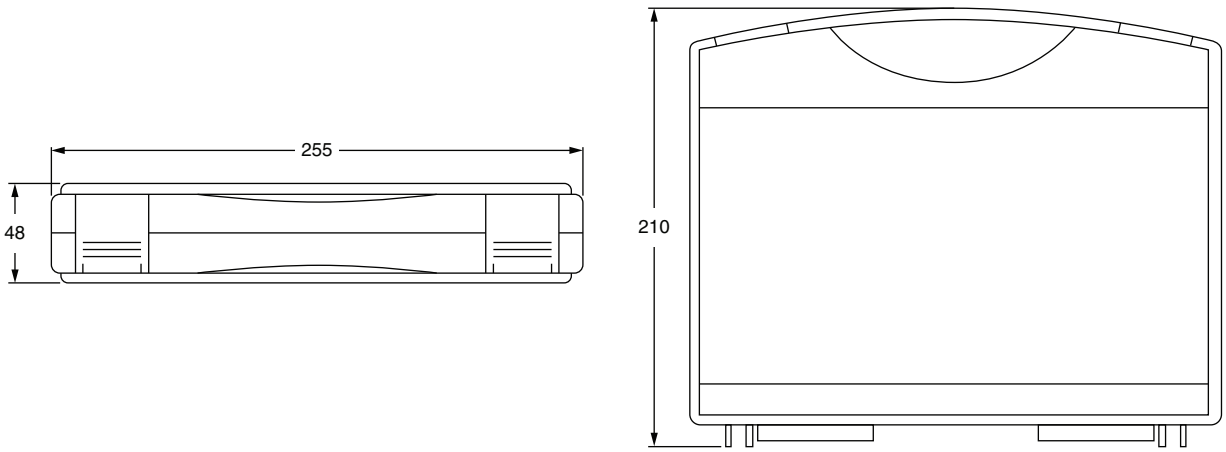
- e3 = Pure tin

PACKAGING

- Box of 15 pieces

KIT WITH SOFTWARE FOR DESIGN SUPPORT ON PLAC 100 TRANSFORMER

DIMENSIONS in millimeters (± 10)



FEATURES OF SOFTWARE

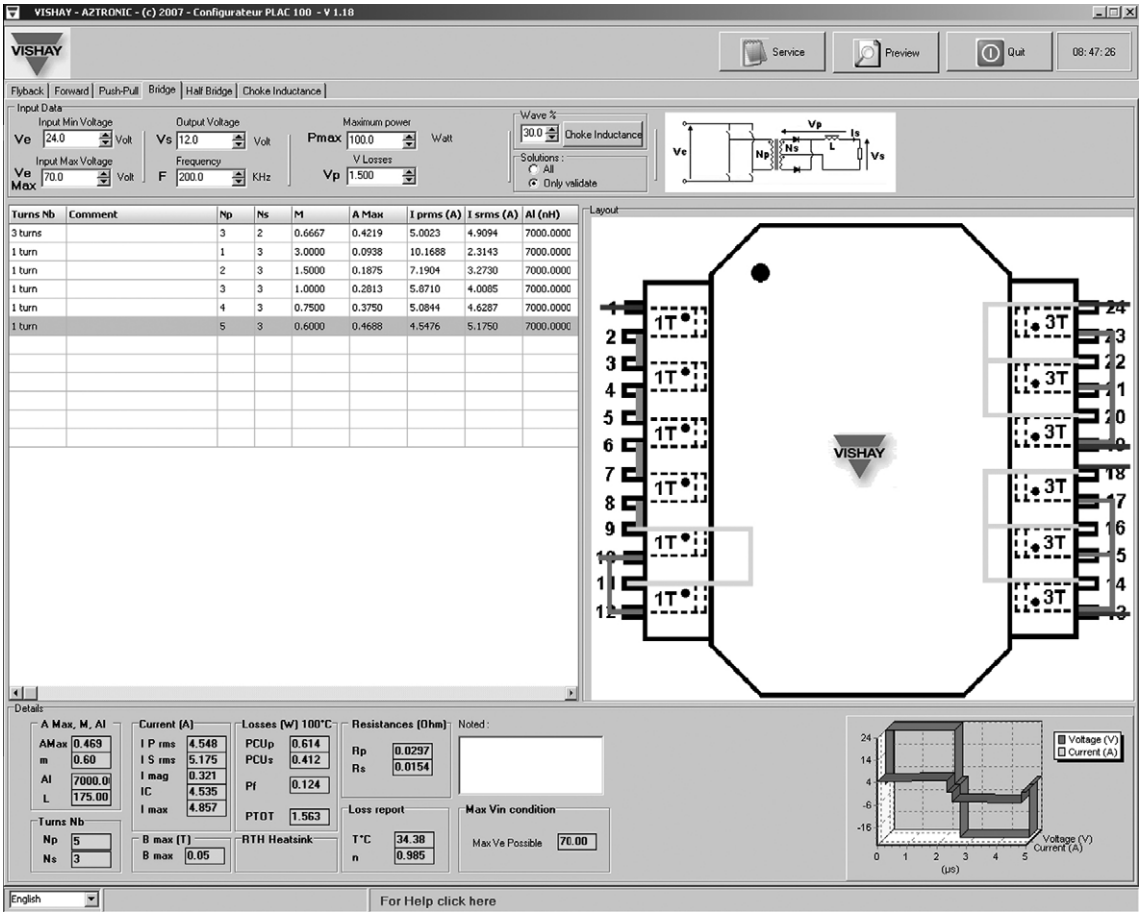
- Interactive
- Directly executable
- Compatible with all versions of WINDOWS
- Available on USB key
- English and French languages
- Designed solutions on PDF format
- Kit includes
  - Software in USB key
  - One part of each type (through hole)
  - 12 female headers

HARDWARE REQUIREMENTS

- PC compatible, WINDOWS 2000, XP and VISTA
- Minimum processor Intel P3 or equivalent
- RAM 128 Mo minimum
- Screen resolution 1024 x 768 minimum
- Directly executable, no installation required

WARNING: This software is a support to technical designers. User is responsible to validate the solution in its own configuration.

KIT WITH VISHAY AZTRONIC (c) 2007-2014 CONFIGURATION PLAC 100 - V1.22



INPUT DATA

Type of power supply:

- Flyback
- Forward
- Push-pull
- Bridge
- Half-bridge

Electrical data:

- Input voltage (V)
- Output voltage (V)
- Power (W)
- Frequency (kHz)

OUTPUT DATA

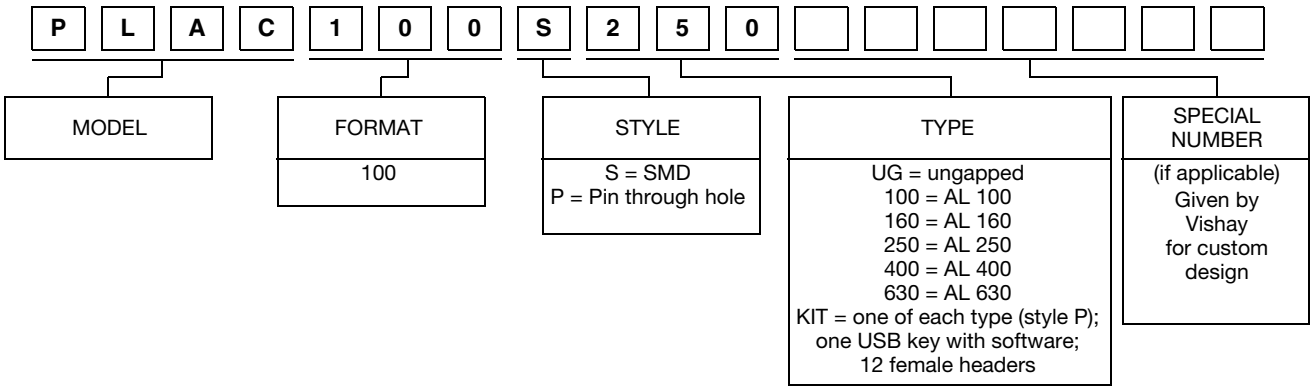
PCB layout

Electrical data:

- Maximum duty cycle
- Ratio
- Primary inductance (µH)
- Input and output current (A)
- Balance of power losses (W)
- Winding resistance (Ω)
- Difference between temperature inside PLAC 100 and ambient temperature

The software allows to calculate all data for the choke inductance when power supply structure needs it.

SAP PART NUMBERING



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