



## Transformers for Switching Power Supplies

Pin terminal type (For multiple outputs)

# ECO series

ECO20 (Vertical/Horizontal types)

ECO22 (Vertical/Horizontal types)

ECO24 (Vertical/Horizontal types)



#### An attention matter on use

Please read this specifications before using this product by all means.

#### An attention matter on security

I undertake use with this product, and it is paid attention enough, and please design an attention matter safely.

# ⚠ Attention on a design When you designs a base of an electric circuit. Please use size of the hole or pad which we recommend. Magnetic flux to leak out occurs. Please confirm it about influence of magnetic flux beforehand. There is fear to cause false movement of machinery. In a design of a base of an electric circuit, Please consider the next contents. In an applied safe standard. The trans and distance with other parts The product is not quakeproof structure. Accordingly please do not add vibration and a shock to it. There is fear to lose a function. ⚠ Attention on the handling

Please do not use it when you let a product drop.
The product produces possibility to lose a function
Please pay attention to the pin which had it pointed keenly.
There is danger to injure.
Please avoid the next place. The place that receives a drop of water, trash, the dust, foggy influence. The place where direct rays of the sun hits. There is
fear to cause false movement of machinery.
Please prohibit safekeeping and use at the next place. Environment to be accompanied with gas corrosion, salt, acid, alkali. There is fear to lose a
function.
When you carry the product on a base of an electric circuit.
Please do not use a metal tool. Recause impossible power is added to a product

⚠ Attention

#### There is fear to lose a function.

I considered the next matter, and we designed a product.

Safe standard and power supply voltage and circuit drive condition, drive frequency and Duty ON-TIME.

By those conditions, we decided structure and the turns number.

Please avoid use in designed condition outside.

There are destruction of a circuit part and fear of ignition.

This product considered a characteristic of a component and a self temperature rise, and it was made.

We select range of humidity as use temperature already.

Please avoid use by range more than this.

There are the damage and fear of ignition.

- Please avoid use in the environment next.
  - The environment that trash and the dust stick to a product. There is fear to cause a fire.
- The products listed on this specification sheet are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.
- The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property.
- If you intend to use the products in the applications listed below or if you have special requirements exceeding the range or conditions set forth in this catalog, please contact us.
  - (1) Aerospace/Aviation equipment
  - (2)Transportation equipment (cars, electric trains, ships, etc.)
  - (3) Medical equipment
  - (4) Power-generation control equipment
  - (5) Atomic energy-related equipment
  - (6) Seabed equipmentapplications
  - (7) Transportation control equipment

- (8) Public information-processing equipment
- (9) Military equipment
- (10) Electric heating apparatus, burning equipment
- (11) Disaster prevention/crime prevention equipment
- (12) Safety equipment
- (13) Other applications that are not considered general-purpose applications

When designing your equipment even for general-purpose applications, you are kindly requested to take into consideration securing protection circuit/device or providing backup circuits in your equipment.

# **Transformers for Switching Power Supplies ECO series**

Contents			Page
Development C	Concept		4
Overview			5
Product Lineup			7
ECO20 series	For multiple outputs	(Vertical/Horizontal types)	9
ECO22 series	For multiple outputs	(Vertical/Horizontal types)	12
ECO24 series	For multiple outputs	(Vertical/Horizontal types)	17
List of Plans for	Standard Windings a	nd Connections	26
Design Referer	nce for Switching Powe	er Transformers	30
Specification R	equest Forms		
For Flyback (	Converter		33
For Home Ap	pliances		34



## Transformers for Switching Power Supplies Pin terminal type (For multiple outputs)

Product compatible with RoHS directive Compatible with lead-free solders

## **Development Concept of the ECO Series**

The ECO series is compliant with worldwide safety standards\*. It is a pin-compatible, newly developed transformer that can be downsized and thinned.

\* Applicable as of April 2007: UL/IEC/J 60065 Ver.7 (TV, DVD, STB), UL/IEC/60950 Ver.3 (printer), UL/IEC 60335-1 Ver.4 (home appliance)

#### MATERIAL

Optimum materials and core shape have been developed. No insulation-supporting material is used, and this secures the insulating distance.

While optimizing materials, TDK has further improved its proprietary core shape to develop a new-type ECO core. TDK has downsized the product considerably in order to securing the necessary creepage distance.

#### MANUFACTURING METHOD

Since the ECO Series supports automatic winding, the product is of a high quality and can be manufactured stably.

It is designed to support automatic winding, which enables a remarkable reduction in the loss generated to achieve a proficient in manual winding until stable production.

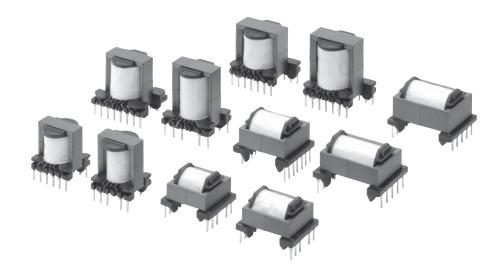
#### OPTIMIZATION DESIGN

Using design tools developed with TDK's comprehensive know-how, high-precision design has been achieved in a short period of time.

- 1) For optimization design and high-quality stable production, customers can use a specification request form.
- 2) If you provide the necessary information in the form, you will receive the optimization design in a short time.
- 3) We have prepared an individual specifications request document for the home appliance market.
- 4) TDK recommends design with a standard core gap (AL-value) for optimization and shorter trial and mass production lead time. Plans for standard winding connection (patterns of recommended pin arrangement and winding structure) are available. These help to speed up the design process, support automatic winding, and prevent deterioration in quality.

#### **ENVIRONMENT**

The ECO series is RoHS directive-compliant.





# Transformers for Switching Power Supplies Pin terminal type (For multiple outputs)

Product compatible with RoHS directive Compatible with lead-free solders

## **Overview of the ECO Series**

#### **FEATURES**

- O Downsized yet compliant with worldwide safety standards.
- O Supports automatic winding.
- Oconsiderably reduced characteristic variations.
- O Product compatible with RoHS directive.

#### **APPLICATION**

- O Set-top boxes, air-conditioners, DVD players/recorders
- O Blu-ray disc players/recorders, printers, LCD monitors
- Multiple-output power supplies

#### **■ PART NUMBER CONSTRUCTION**

ECO		2017SEO	-		
Series nam	е	Core shape		Interna	al code

#### ■ OPERATING TEMPERATURE RANGE, PACKAGE QUANTITY, PRODUCT WEIGHT

	Temperat	ure range	Humidit	y range	Standard te	est conditions
Туре	Operating temperature*	Storage temperature	Operating humidity range**	Storage humidity range**	Ambient temperature	Relative humidity range***
	(°C)	(°C)	(%RH)	(%RH)	(°C)	(%RH)
ECO2017	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2020	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2023	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2219	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2225	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2230	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2420	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2425	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75
ECO2430	-30 to +120	-40 to +80	10 to 95	10 to 95	25 ± 10	25 to 75

<sup>\*</sup> With self-heating

<sup>\*\*</sup> Maximum wet-bulb temperature 38°C, without dewing

<sup>\*\*\*</sup>Without dewing

OROHS Directive Compliant Product: See the following for more details related to RoHS Directive compliant products. http://www.tdk.co.jp/rohs/



## **Overview of the ECO Series**

#### **■ GENERAL CHARACTERISTICS**

Item	Standards	Test methods
Inductance	Individual specification (tolerance±10%)	Use LCR meter (f=10kHz), 4263B or equivalent.
DC resistance	Less than $0.1\Omega$ : $\pm 30\%$ $0.1\Omega$ to $1.0\Omega$ : $\pm 20\%$ $1.0\Omega$ or more: $\pm 15\%$	Use Ohm-meter AX114N or equivalent.
Turn ratio and polarity	Specified value ±1 to 20%, individual specification	Use turn ratio tester TRM-201 (f=1 to 100kHz) or equivalent.
Withstand voltage	No abnormality between the primary and secondary windings, between the primary winding and the core, and so on.	Apply separately specified AC voltage (50Hz) for 1min.
Insulation resistance	100MΩ min.	Measure by applying DC.500V. Use insulation resistance meter SM-5E or equivalent.
Temperature rise	Standard design value 45°C max. (thermocouple method) 55°C max. (resistance method)	Measure the core surface by thermocouple method, and the windings by resistance method or thermocouple method.

#### **RELIABILITY TESTS**

Item	Standards	Test methods					
Vibration resistance		Sweep 1.5mm amplitude and 10-to-55-to-10Hz in 1min in X, Y, and Z directions for 2h respectively.					
Heat resistance Standard of inductance, insulation		Measure in normal temperature after leaving in 100±2°C for 96h.					
Cold resistance	resistance, withstand voltage must be	Measure in normal temperature after leaving in -40±2°C for 96h.					
Humidity resistance	satisfied.	Measure in normal temperature after leaving in 60±2°C and 90 to 95(%)RH for 96h.					
Temperature cycle		One cycle is –25°C for 30min, normal temperature for 30min, and 85°C for 30min; measure after 10 cycles of the test have been performed.					
Terminal strength	9.8N min.	Apply 9.8N load in the direction of terminal axis for 30±5s.  Any terminal must not be pulled out or chatter.					
Solderability	Solder covers more than 90%.	Dip in solder with the temperature of 245±2°C for 3±0.5s.					

<sup>●</sup>The above listed items are representative examples.

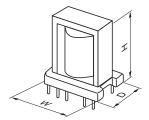
The details can be found by referring to the appended individual delivery specifications.



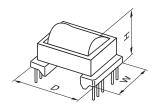
## **Product Lineup**

We have made a new lineup of replacement parts for products with different shapes that meet our customers' needs for smaller products. We can also provide different transformer shapes not shown in the catalog, so feel free to contact us.





Horizontal type



#### ■ Product Lineup

	Core param	neter			Bobbin p	parameter			Dimensions
	General-					Terminal			Dimensions
New	purpose	Cross-sectional	Reference	Switching	Bobbin	Pin pitch	Lead	Number	Depth Width Height
shaped*1	shaped	center leg area		. ,	Type*3		space	of pins	$D \times W \times H$
	cores	Ae (mm²)	(W)	fsw(kHz)	Туре	Р	F		(mm)max.
						(mm)	(mm)		(IIIII)IIIax.
Vertical type									
ECO2017	- El22		12		VI				19.5 22.5 24.0
ECO2020	- EE25/19	36.3	20	_ 50	VI	3.75	15.0	12	19.5 22.5 27.0
ECO2023			26		VI				19.5 22.5 30.0
					VI	5.0	17.5	12	23.0 28.5 25.0
ECO2219		46.4	25	50	VII	4.0	17.5	12	23.0 24.0 25.0
	_				VIII	3.75	17.5	14	23.0 30.0 25.0
	EED2820				VI	5.0	17.5	12	23.0 28.5 31.0
ECO2225	EER28	46.4	36	50	VII	4.0	17.5	12	23.0 28.5 31.0
					VIII	3.75	17.5	14	23.0 30.0 31.0
EC02220	_	46.4	48	50	VI	5.0	17.5	12	23.0 28.5 36.0
ECO2230		40.4	48	50	VII	4.0	17.5	12	23.0 24.0 36.0
FC00400		63.8	0.5	50	VI	5.0	17.5	12	24.0 28.5 26.5
ECO2420		03.8	35	50	VII	4.0	20.0	14	25.0 31.5 26.5
FC0040F	FEDON	00.0	F0	50	VI	5.0	17.5	12	24.0 28.5 31.5
ECO2425	EER28L	63.8	50	50	VII	4.0	20.0	16	25.0 35.5 31.5
F000400	=	00.0	00	50	VI	5.0	17.5	12	24.0 28.5 36.5
ECO2430		63.8	68	50	VII	4.0	20.0	16	25.0 35.5 36.5
Horizontal type									
ECO2017			5		HI	3.75	20.0	12	24.5 23.5 20.0
ECO2020	EE25/19	36.3	14	50	HI	3.75	22.5	12	27.0 23.5 20.0
ECO2023	=		20	_	HI	3.75	25.0	12	29.5 23.5 20.0
FCC0010		40.4	10	50	HI	5.0	20.0	12	25.0 29.0 24.0
ECO2219	- EER2820	46.4	18	50	HII	4.0	20.0	12	25.0 26.0 24.0
F00000F	- EER2820	40.4	00	50	HI	5.0	25.0	12	30.5 29.0 24.0
ECO2225		46.4	30	50	HII	4.0	25.0	12	30.5 26.0 24.0
F000000		10.1	40	50	HI	5.0	30.0	12	35.5 29.0 24.0
ECO2230	FFDOO	46.4	42	50	HII	4.0	30.0	12	35.5 26.0 24.0
	- EER28	22.2	4.4	50	HI	5.0	25.0	12	30.5 30.0 25.0
ECO2425		63.8	41	50	HII	4.0	25.0	12	30.5 27.0 25.0
	=====				HI	5.0	30.0	12	36.0 30.0 25.0
ECO2430	EER28L	63.8	59	50	HII	4.0	30.0	12	36.0 27.0 25.0
Horizontal type (S	SLD type)								
ECO2425SLD	,, ,	46.7	29	50	н	4.0	25.0	12	30.0 26.0 20.0
							-		

<sup>\*1</sup> Ferrite cores are not sold separately.

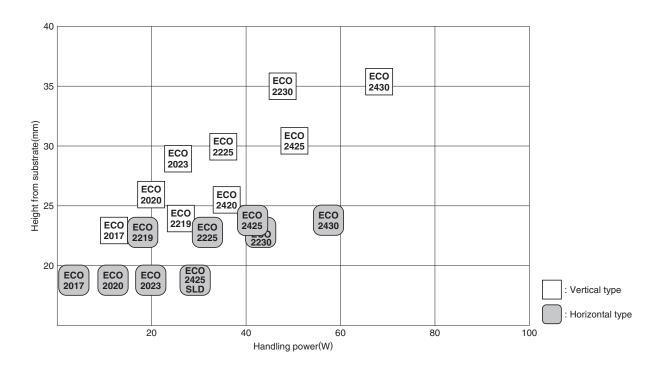
<sup>\*2</sup> The reference output was obtained under conditions where the frequency was 50kHz and creepage distance was 4mm. (See the relevant page for details of each shape.) The reference output differs depending on the switching device, switching frequency, transformer temperature, conditions, etc. Use this output for reference.

<sup>\*3</sup> The bobbin is made from phenol with a flame resistance grade of 94V-2 or higher.

<sup>•</sup> All specifications are subject to change without notice.



## **Lineup of ECO Series**



<sup>•</sup> All specifications are subject to change without notice.



## ECO20 series For Multiple Outputs (Vertical/Horizontal types)

#### **ELECTRICAL CHARACTERISTICS**

: Recommended range

		Transforme	er handling pov	ver(W) [Vertica	I/Horizontal typ	oe]*					
Time a	Гио жилом жи	Creepage distance									
Туре	Frequency										
		0.0mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.4mm	8.0mm		
	50kHz	33	21/18	19/14	15/10	12/ 5	7/-	_	_		
ECO2017	75kHz	49	31/26	28/21	23/15	17/ 8	10/-	1/-	_		
	100kHz	54	34/29	31/24	25/16	19/ 8	11/–	1/-	_		
	50kHz	37	28/25	26/22	23/18	20/14	16/8	10/–	3/-		
ECO2020	75kHz	56	41/38	39/33	35/28	30/21	24/13	15/ 1	5/-		
	100kHz	59	46/40	41/35	37/29	31/22	25/14	16/ 1	5/-		
	50kHz	42	33/31	31/28	29/25	26/20	22/15	17/8	11/–		
ECO2023	75kHz	62	50/46	47/42	43/37	39/31	33/23	25/13	16/–		
	100kHz	64	51/47	48/43	44/37	39/31	34/24	26/13	16/-		

<sup>\*</sup> The Vertical type places its described creepage distance and its half distance on the terminal side and guard side, respectively. The Horizontal type places its described creepage distance on both sides.

Transformer-handling power may differ depending on switching devices, switching frequency, transformer temperature, conditions during usage, etc. Therefore, use the handling power for reference only.

	Core para	meter		Bobbin p	arameter			Dime	nsions		Applia	cations		
Туре	General- purpose cores	cores material	center leg area Ae (mm²)	Bobbin Type	Spool width (mm) min.	Spool height (mm) min.	Number of pins	Depth D × (mm)	W ×	Height H		Air condi- tioner	DVD BD	Others
ECO2017			· · · · ·	VI	10.4	3.6	12	19.5	22.5	24.0				
ECO2017				HI	9.8	3.7	12	24.5	23.5	20.0		0		
ECO2020	EE25/19	PC47	36.3	VI	13.4	3.6	12	19.5	22.5	27.0	$\sim$	$\circ$	$\circ$	
L002020	(EI22)	family	30.3	HI	12.8	3.7	12	27.0	23.5	20.0	O	0 (	O	
ECO2023	=			VI	16.4	3.6	12	19.5	22.5	30.0	$\circ$	$\sim$		
EUU2023				HI	15.8	3.7	12	29.5	23.5	20.0	$\cup$	O	O	

#### **STANDARD CORE AL-value**

Type	AL-valu	e: R20 seri	es(nH/N²)									
Туре	100	112	125	140	160	180	200	224	250	280	315	400
For multiple outputs												
ECO2017	0	0	0	0	0	0	0	0	0	0		
ECO2020	0	0	0	0	0	0	0	0	0	0		
ECO2023	0	0	0	0	0	0	0	0	0	0		

In order to respond to our customers' requested delivery dates and costs, TDK can provide standard GAP products (indicated by " O" in the below chart) for each shape.

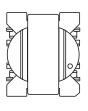
Please contact us about other GAP products separately.

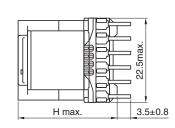
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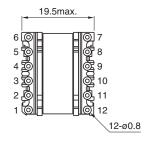


#### **SHAPE & DIMENSIONS**

Bobbin type: VI



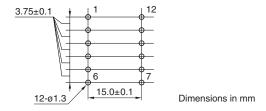




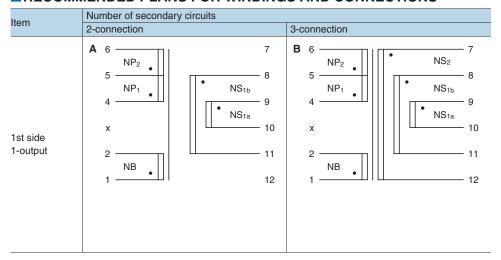
Dimensions in mm

Туре	Bobbin type	H max.
ECO2017	VI	24.0
ECO2020	VI	27.0
ECO2023	VI	30.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS

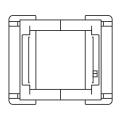


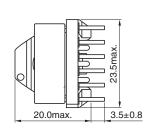
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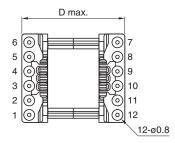
## ECO20 series For Multiple Outputs (Horizontal type)

#### **SHAPE & DIMENSIONS**

Bobbin type: HI



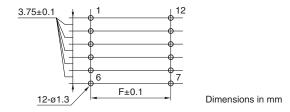




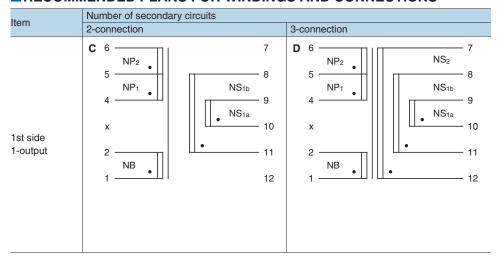
Dimensions in mm

Туре	Bobbin type	D max.	F
ECO2017	HI	24.5	20.0
ECO2020	HI	27.0	22.5
ECO2023	HI	29.5	25.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS





## ECO22 series For multiple Outputs (Vertical/Horizontal types)

#### **ELECTRICAL CHARACTERISTICS**

: Recommended range

		Transforme	er handling pov	ver(W) [Vertica	l/Horizontal typ	pe]*			
Tuno	Fraguenov	Creepage							
Туре	Frequency	distance							
		0.0mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.4mm	8.0mm
	50kHz	47	36/32	33/28	30/24	25/18	20/11	13/ 1	4/
ECO2219	75kHz	69	52/47	48/42	43/34	37/26	29/16	18/ 2	6/-
	100kHz	67	51/46	48/41	42/34	36/26	29/16	18/ 2	6/-
	50kHz	57	46/43	44/40	40/35	36/30	32/23	25/14	17/3
ECO2225	75kHz	78	64/59	61/54	56/48	50/41	43/32	34/19	23/4
	100kHz	77	63/58	60/53	55/47	49/40	43/31	33/18	22/4
	50kHz	67	57/54	55/51	52/47	48/42	44/36	37/27	30/18
ECO2230	75kHz	87	75/71	72/67	68/61	63/55	57/47	49/36	39/23
	100kHz	86	73/70	71/65	67/60	62/54	56/46	48/35	39/23

<sup>\*</sup> The Vertical type places its described creepage distance and its half distance on the terminal side and guard side, respectively. The Horizontal type places its described creepage distance on both sides.

Transformer-handling power may differ depending on switching devices, switching frequency, transformer temperature, conditions during usage, etc. Therefore, use the handling power for reference only.

	Core para	meter		Bobbin p	arameter			Dimer	nsions		Annlie	cations			
T	General-		center leg		Spool	Spool				Height	Дррік				
Туре	purpose	cores	area	Bobbin	width	height	Number	D×	W ×	Н		Air			
	cores	material	Ae (mm²)	Type	(mm) min.	(mm) min.	of pins	(mm)ı	max.		STB	condi- tioner	DVD	BD	Others
				VI	11.9	4.1	12	23.0	28.5	25.0					
				VII	11.9	4.1	12	23.0	24.0	25.0					
ECO2219				VIII	11.9	4.1	14	23.0	30.0	25.0	0	$\circ$			
				HI	11.6	4.3	12	25.0	29.0	24.0					
	_			HII	11.6	4.3	12	25.0	26.0	24.0					
				VI	17.2	4.1	12	23.0	28.5	31.0					
	EER28	PC47	46.4	VII	17.2	4.1	12	23.0	24.0	31.0					
ECO2225	EED2820	family	40.4	VIII	17.2	4.1	14	23.0	30.0	31.0	0	$\circ$	0	0	0
				HI	16.9	4.3	12	30.5	29.0	24.0					
	_			HII	16.9	4.3	12	30.5	26.0	24.0					
				VI	22.2	4.1	12	23.0	28.5	36.0					
ECO2230				VII	22.2	4.1	12	23.0	24.0	36.0	$\bigcirc$	0	$\circ$	$\circ$	$\circ$
2002200			HI	21.9	4.3	12	35.5	29.0	24.0	$\cup$	$\circ$	$\cup$	$\cup$	0	
				HII	21.9	4.3	12	35.5	26.0	24.0					

#### ■ STANDARD CORE AL-value

Tuno	AL-valu	e: R20 seri	es(nH/N²)									
Туре	100	112	125	140	160	180	200	224	250	280	315	400
For multiple output	S											
ECO2219	0	0	0	0	0	0	0	0	0	0	0	
ECO2225	0	0	0	0	0	0	0	0	0	0	0	
ECO2230	0	0	0	0	0	0	0	0	0	0	0	

In order to respond to our customers' requested delivery dates and costs, TDK can provide standard GAP products (indicated by "" in the below chart) for each shape.

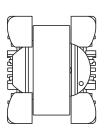
Please contact us about other GAP products separately.

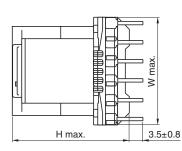
<sup>•</sup> All specifications are subject to change without notice.

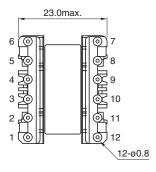


#### **SHAPE & DIMENSIONS**

Bobbin type: VI 、VII



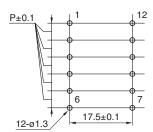




Dimensions in mm

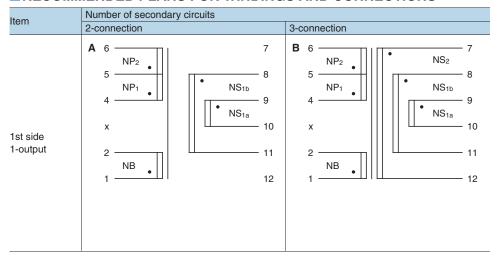
Туре	Bobbin type	W max.	H max.	Р
ECO2219	VI	28.5	25.0	5.0
E002219	VII	24.0	25.0	4.0
ECO2225	VI	28.5	31.0	5.0
EUU2225	VII	24.0	31.0	4.0
ECO2230	VI	28.5	36.0	5.0
ECO2230	VII	24.0	36.0	4.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



Dimensions in mm

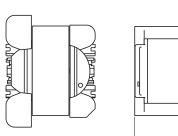
#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS

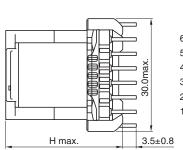


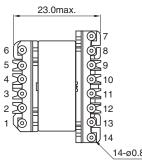


#### **SHAPE & DIMENSIONS**

Bobbin type: VIII



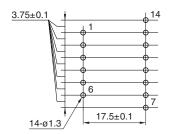




Dimensions in mm

Type	Bobbin type	H max.
ECO2219	VIII	25.0
ECO2225	VIII	31.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE

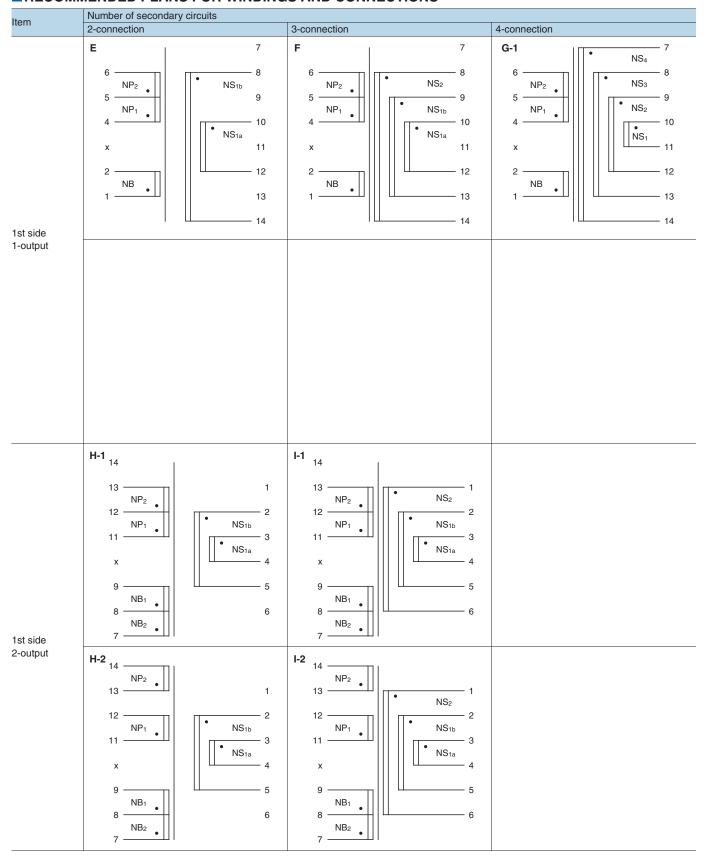


Dimensions in mm

<sup>•</sup> All specifications are subject to change without notice.



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS

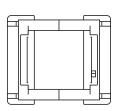


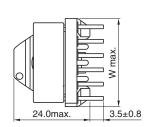
<sup>•</sup> All specifications are subject to change without notice.

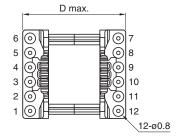
## ECO22 series For Multiple Outputs (Horizontal type)

#### **SHAPE & DIMENSIONS**

Bobbin type: HI 、HII



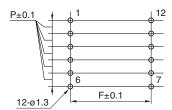




Dimensions in mm

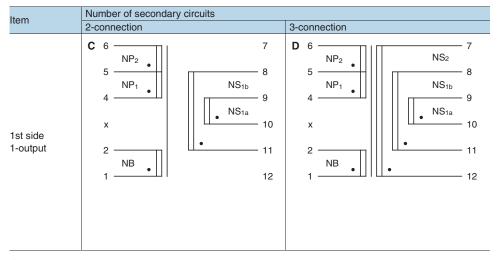
Туре	Bobbin type	D max.	W max.	Р	F
ECO2219	HI	25.0	29.0	5.0	20.0
L002219	HII	25.0	26.0	4.0	20.0
ECO2225	HI	30.5	29.0	5.0	25.0
E002223	HII	30.5	26.0	4.0	25.0
ECO2230	HI	35.5	29.0	5.0	30.0
E002230	HII	35.5	26.0	4.0	30.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



Dimensions in mm

#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS





## ECO24 series For multiple outputs (Vertical/Horizontal types)

#### **ELECTRICAL CHARACTERISTICS**

: Recommended range

		Transforme	r handling pov	ver(W) [Vertica	I/Horizontal typ	pe]*			
Туре	Frequency	Creepage distance							
		0.0mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.4mm	8.0mm
	50kHz	66	50/-	46/-	41/–	35/–	28/-	18/–	6/-
ECO2420	75kHz	85	65/–	60/–	53/-	46/-	36/–	23/–	8/–
	100kHz	83	63/–	59/–	52/-	45/-	35/-	22/-	7/–
	50kHz	79	64/59	61/54	56/48	50/41	43/32	34/19	23/4
ECO2425	75kHz	96	78/72	74/66	68/59	61/50	53/39	41/23	28/5
	100kHz	94	77/71	73/65	67/57	60/49	52/38	40/22	27/5
	50kHz	95	81/76	78/72	73/66	68/59	62/51	53/39	43/25
ECO2430	75kHz	107	92/87	88/82	83/75	77/67	70/58	60/44	48/29
	100kHz	105	90/85	86/80	81/73	76/66	69/56	59/43	47/28
	50kHz	57	<b>-/44</b>	-/40	<b>-/35</b>	<b>-/29</b>	-/22	<del>-</del> /12	_
ECO2425SLD	75kHz	80	<b>-/60</b>	<b>-/</b> 55	-/48	-/40	<b>-/31</b>	<b>-</b> /17	_
	100kHz	78	<b>-/59</b>	-/54	<b>-/47</b>	-/39	-/30	<b>-/16</b>	_

<sup>\*</sup> The Vertical type places its described creepage distance and its half distance on the terminal side and guard side, respectively. The Horizontal type places its described creepage distance on both sides.

Transformer-handling power may differ depending on switching devices, switching frequency, transformer temperature, conditions during usage, etc. Therefore, use the handling power for reference only.

	Core para	meter		Bobbin p	arameter			Dime	nsions		Applia	cations			
_	General-		center leg		Spool	Spool		Depth	n Width	Height					
Type	purpose	cores	area	Bobbin	width	height	Number	DΧ	W×	Н		Air			
	cores	material	Ae (mm²)	Type	(mm) min.	(mm) min.	of pins	(mm)	max.		STB	condi- tioner	DVD	BD	Others
ECO2420				۷I	12.1	4.6	12	24.0	28.5	26.5	_	$\sim$			
ECO2420				VII	12.1	4.6	14	25.0	31.5	26.5	0	0			
	_			VI	17.1	4.6	12	24.0	28.5	31.5					
ECO2425				VII	17.1	4.6	16	25.0	35.5	31.5	$\circ$	$\circ$	$\circ$	$\circ$	$\circ$
ECO2423	EER28	PC47	63.8	HI	16.8	4.8	12	30.5	30.0	25.0	0	0	0	0	0
	EER28L	family	03.0	HII	16.8	4.8	12	30.5	27.0	25.0					
	_			VI	22.1	4.6	12	24.0	28.5	36.5					
ECO2430				VII	22.1	4.6	16	25.0	35.5	36.5			$\circ$	$\circ$	$\circ$
ECO2430				HI	21.8	4.8	12	36.0	30.0	25.0			0	0	O
				HII	21.8	4.8	12	36.0	27.0	25.0					
ECO2425SLD		PC47 family	46.7	ні	16.3	4.2	12	30.0	26.0	20.0	0	0	0	0	0

#### ■ STANDARD CORE AL-value

Tuno	AL-valu	e: R20 seri	es(nH/N²)									
Туре	100	112	125	140	160	180	200	224	250	280	315	400
For multiple output	its											
ECO2420	0	0	0	0	0	0	0	0	0	0	0	
ECO2425	0	0	0	0	0	0	0	0	0	0	0	
ECO2430	0	0	0	0	0	0	0	0	0	0	0	
ECO2425SLD	0	0	0	0	0	0	0	0	0			

In order to respond to our customers' requested delivery dates and costs, TDK can provide standard GAP products (indicated by "  $\bigcirc$  " in the below chart) for each shape.

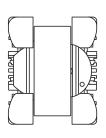
Please contact us about other GAP products separately.

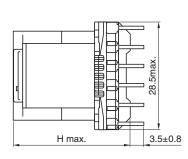
<sup>•</sup> All specifications are subject to change without notice.

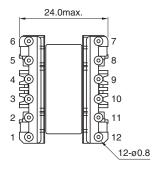


#### **SHAPE & DIMENSIONS**

Bobbin type: VI



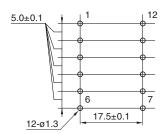




Dimensions in mm

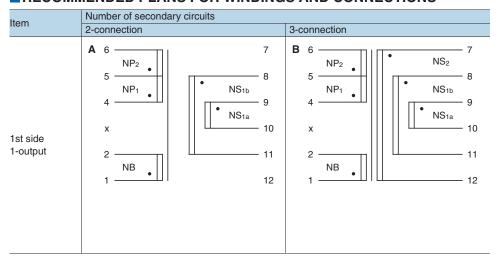
Туре	Bobbin type	H max.
ECO2420	VI	26.5
ECO2425	VI	31.5
ECO2430	VI	36.5

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



Dimensions in mm

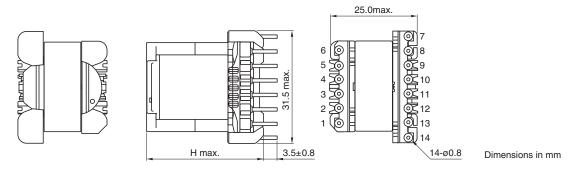
#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS





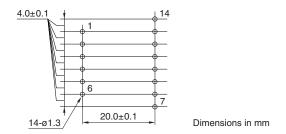
#### **SHAPE & DIMENSIONS**

Bobbin type: VII



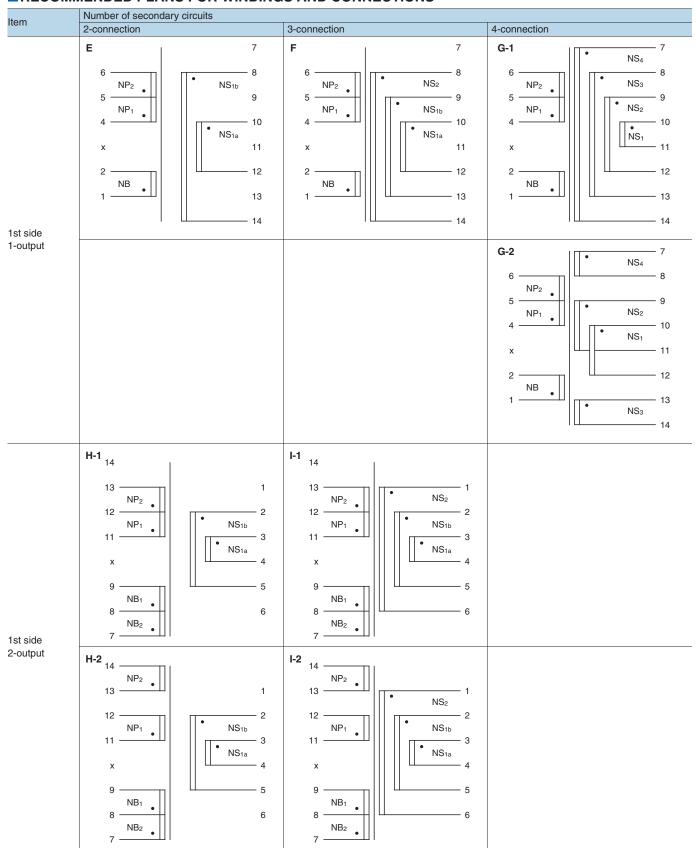
Type	Bobbin type	H max.
ECO2420	VII	26.5

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



• All specifications are subject to change without notice.

#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS



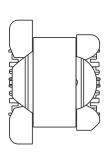
<sup>•</sup> Please refer to P.26 for more details about the list of plans for standard windings and connections.

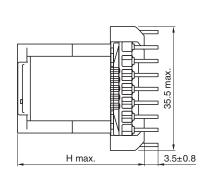
<sup>•</sup> All specifications are subject to change without notice.

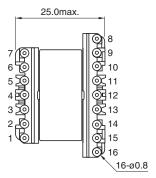


#### **SHAPE & DIMENSIONS**

Bobbin type: VII



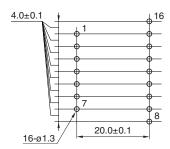




Dimensions in mm

Туре	Bobbin type	H max.
ECO2425	VII	31.5
ECO2430	VII	36.5

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE

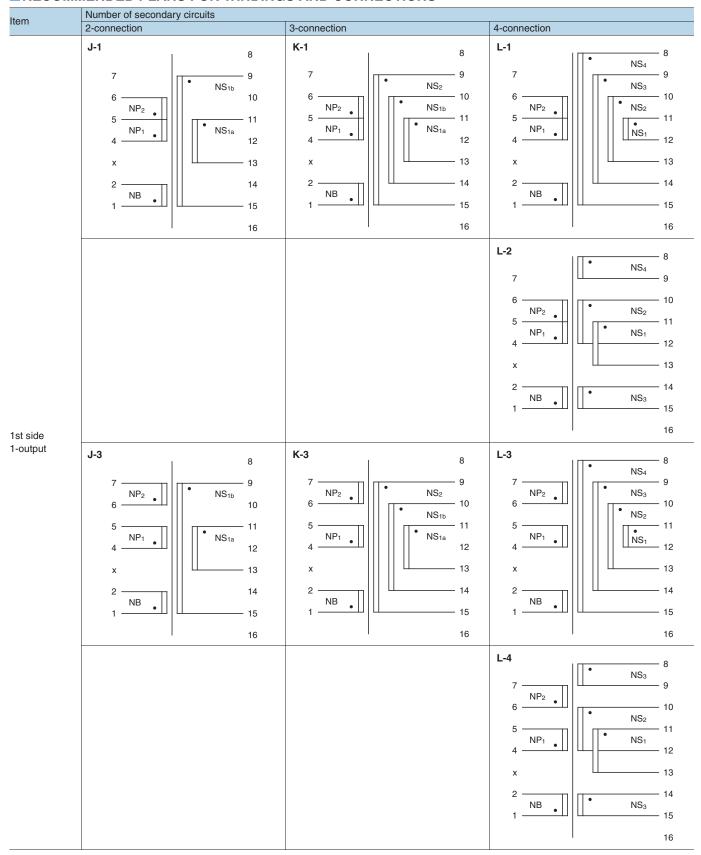


Dimensions in mm

<sup>•</sup> All specifications are subject to change without notice.



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS

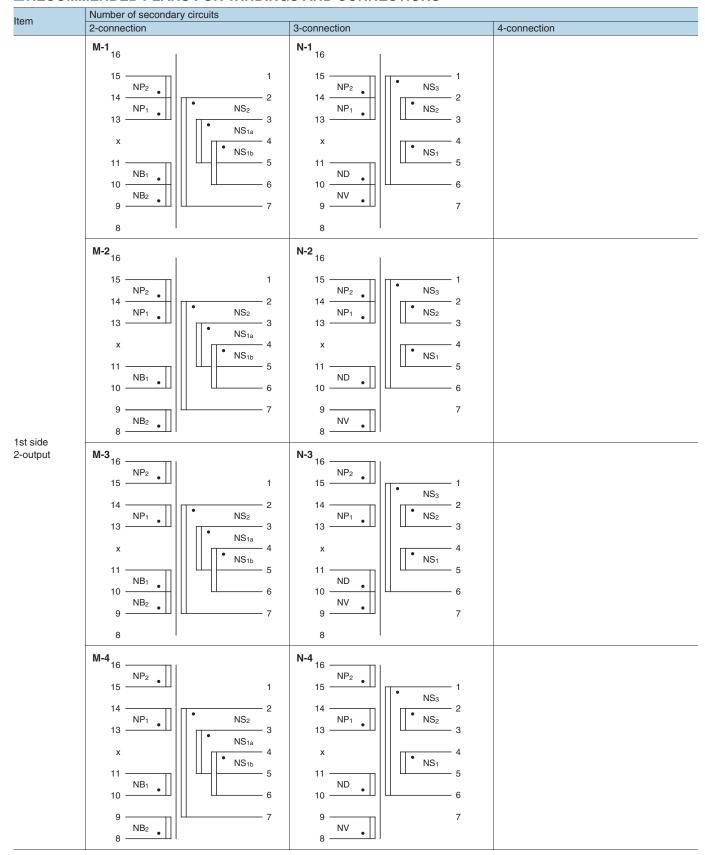


Please refer to P.26 for more details about the list of plans for standard windings and connections.

<sup>•</sup> All specifications are subject to change without notice.



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS



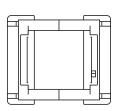
<sup>•</sup> All specifications are subject to change without notice.

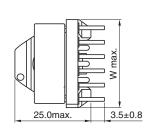


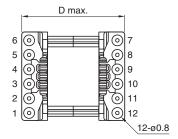
## ECO24 series For Multiple Outputs (Horizontal type)

#### **SHAPE & DIMENSIONS**

Bobbin type: HI 、HII



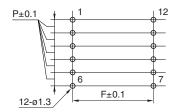




Dimensions in mm

Туре	Bobbin type	D max.	W max.	Р	F
ECO2425	HI	30.5	30.0	5.0	25.0
E002425	HII	30.5	27.0	4.0	25.0
ECO2430	HI	36.0	30.0	5.0	30.0
EUU2430	HII	36.0	27.0	4.0	30.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



Dimensions in mm

#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS

Item	Number of secondary circuits		
item	2-connection		3-connection
1st side 1-output	C 6 NP2 NP1 NS1b  x 2 NB 1	7 - 8 - 9 - 10 - 11 12	D 6 NP2 NS2 8 NS1b 9 NS1a 10 11

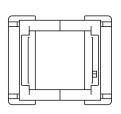
<sup>•</sup> All specifications are subject to change without notice.

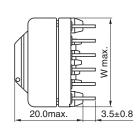


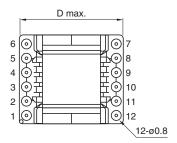
## ECO24 series For Multiple Outputs (Horizontal type) SLD Type

#### **SHAPE & DIMENSIONS**

Bobbin type: HI



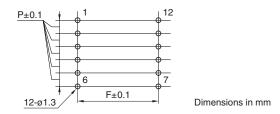




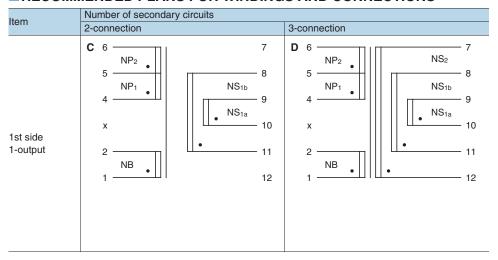
Dimensions in mm

Туре	Bobbin type	D max.	W max.	Р	F
ECO2425SLD	HI	30.0	26.0	4.0	25.0

#### ■ RECOMMENDED BASE MATERIAL OPENING SIZE



#### ■ RECOMMENDED PLANS FOR WINDINGS AND CONNECTIONS



<sup>•</sup> All specifications are subject to change without notice.



## ECO series List of Plans for Standard Windings and Connections

Item	Number of secondary circuits		
item	2-connection	3-connection	4-connection
	A 6 NP2	B 6 NP2 NS2 NS2 8 NS1b 9 NS1a 10 12	G-1  6  NP <sub>2</sub> 5  NP <sub>1</sub> 4  NS <sub>3</sub> 9  NS <sub>2</sub> 10  NS <sub>1</sub> 11  12  13
1st side 1-output	C 6 NP2	NS <sub>2</sub> NS <sub>1b</sub> NS <sub>1b</sub> NS <sub>1b</sub> NS <sub>1a</sub> NS <sub>1a</sub> NS <sub>1a</sub> 10  11	G-2  6  NP2  5  NP1  4  NS2  9  NS2  10  NS1  11  12  NS3  13
	6 NP2 NS1b 9 NS1b 9 NS1a 11 12 NB 13	F 7 6 NP2 NS2 9 NS1b 10 X 11 2 NB 11 13	

<sup>•</sup> All specifications are subject to change without notice.

Itom	Number of secondary circuits		
nem	2-connection	3-connection	4-connection
Item		3-connection  K-1  7  6  NP2  5  NP1  4  NP1  10  NS1b  11  NS1a  12  X  2  NB  14  15  16	4-connection  L-1  7  6  NP2  5  NP1  4  NS4  9  NS3  10  NS2  11  NS1  12  X  13  14  15  16  L-2  7  NS4  9  NS4  9  NS4  9  NS4  9  NS4  9
1st side 1-output	J-3  7  NP2  NS1b  NS1b  10  NS1a  11  NS1a  12	K-3  7  NP2  NS2  NS1b  10  NS1b  11  NS1a  12	6 NP <sub>2</sub> NS <sub>2</sub> 11 NP <sub>1</sub> NS <sub>1</sub> 12  X 13  2 NB NS <sub>3</sub> 15  16  L-3  7 NP <sub>2</sub> NP <sub>2</sub> NS <sub>3</sub> 10  5 NP <sub>1</sub> NS <sub>3</sub> 10  5 NS <sub>3</sub> 10  NS <sub>4</sub> 9  NS <sub>3</sub> 10  NS <sub>2</sub> 11  NS <sub>1</sub> 12
	x 13 14 15 16	x 2 NB . 14 15 16	X

<sup>•</sup> All specifications are subject to change without notice.



Item	Number of secondary circuits 2-connection	3-connection	4-connection
	H-1	1.4	4-comilection
	13 NP <sub>2</sub> 1 1 2 NS <sub>1b</sub> 3 NS <sub>1a</sub> 4 9 NS <sub>1a</sub> 4 6 7	13	
1st side	H-2  13  NP2  13  1  12  NP1  NP1  NS1b  NS1b  NS1a  4  9  NS1a  4  9  NB1  NB2  7	I-2  13  NP2  13  NP1  NS2  NS2  NS1b  NS1b  NS1a  NS1a  4  9  NB1  NB1  NB2  7	
2-output	M-1 16 15 NP2 14 NP1 13 NP1 10 NB1 10 NB2 8 11 7 8	N-1 16 15 NP2 NS3 1 14 NP1 NP1 NS2 3  x 11 ND NO NV NS1 5  8	
	M-2 16 15 NP2 14 NP1 13 NP1 10 NB1 10 NB2 8 NB2 16 1 NS2 1 NS2 3 NS1a 4 NS1b 5 10 6	N-2 16 15 NP2 NS3 1 14 NP1 NP1 NS2 3  x 11 ND ND 6 9 NV 6	

<sup>•</sup> All specifications are subject to change without notice.



Item	Number of secondary circuits		
item	2-connection	3-connection	4-connection
	M-3 16 15 NP2 1 14 NP1 13 NP1 10 NB1 NB1 NB1 NB2 NS1a NS1a 4 NS1b 5 6 9 7	N-3 16 15 NP2 14 NP1 13 NP1 10 ND 10 NV 9 NS3 1 NS3 2 NS2 3 NS1 5 6 7	
1st side 2-output	M-4 16 15 NP2 1 1 14 NP1 13 NP1 NS2 NS1a 4 NS1b 5 NS1b 6 9 NB2 8 NB2 7	N-4 16 15 NP2 14 NP1 13 NP1 10 NS3 2 NS2 3 X NS1 5 NS1 5 6 9 NV 8 NV  8	

<sup>•</sup> All specifications are subject to change without notice.



### **Design Reference for Switching Power Transformers**

#### · Maximum allowable temperature

The maximum ambient temperature of the transformer is E Class (120°C).

However, there is no E Class for transformers shipped for North America; therefore, the maximum ambient temperature is Class 105 (105°C). [Class 130 (130°C) is possible when UL1446 insulating system is applied.]

#### • Temperature rise in Transformers

In normal design condition,  $55^{\circ}$ C or less (using the resistance method) is the target of temperature rise of windings. Therefore, the maximum ambient temperature at this time is  $65^{\circ}$ C ( $50^{\circ}$ C max. for North America).

In case of measuring the temperature of the windings by thermocouple, 10 to 15°C more would be allowable.

#### · Dealing with safety regulations

Designs are made in consideration of materials, structures an so on that the designed transformers are comply with designated safety regulations.

(1)Regarding the core

To be handled in the same manner as Basic Insulation.

(2)Distance between transformer and other parts

Please keep the distance between the transformer and other
parts in according with applicable safety standards.

#### · Concerning of the influence of leakage flux

Due to the fact that there is always some degree of leakage flux from transformer, designs should be made to keep them apart as much as possible from parts that are easily affected by this.

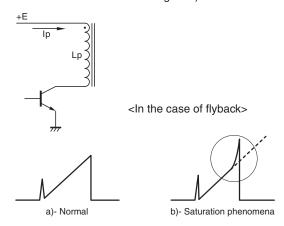
#### · Magnetic saturation of the core

- (1)Magnetic operating condition of the core in the transformer are determined by maximum operation temperature (including temperature rise) and driving condition in circuits. If product is used in condition that exceed these conditions, there is a possibility of occurring magnetic saturation of the core. The following items could be possible cause of core saturation.
  - The product is used in conditions that exceed the maximum operating temperature.
  - Operating frequencies are lower than the ones initially designed. (longer ON time)
  - The input voltage is abnormally higher than the specified values.

(2)To check on the saturation of the core it is possible to judge from current waveforms of primary winding. Current flowing in the inductor changes in a straight line in relation to time as in the figure a) in accordance with

$$I = \frac{E}{I} \times T$$

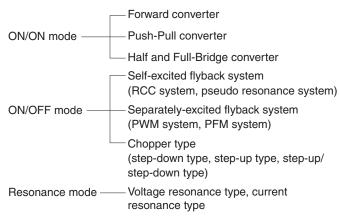
However, in the event that a saturation phenomena has occurred in the core, inductance is reduced causing a rapid and drastic increase of current as shown figure b).



(3)In this case, there is possibility that a breakdown may occur due to surpassing the rated current of the switch it is necessary to have over current protection circuit or modify transformer design.

#### · Circuit topologies of switching power supply

The term "topology" refers to the arrangement of the power components within the switching power supply design. There are several different kind of circuit topologies as following;

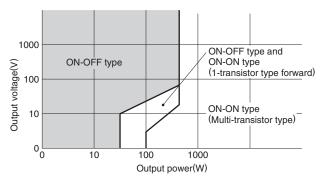


#### **公TDK**

#### · Which topology of switching power supply to use?

Each topology has its relative merit in terms of cost and performance. One topology may have a low parts cost but only be able to provide a limited amount of power; another may have ample power capability but cost more, and so on.

The following relationship between output voltage and power give us one suggestion when we need to chose topology in given conditions;



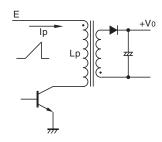
ON-OFF type: For high voltage/small current ON-ON type: For low voltage/large current

#### The deference of power conversion between Forward and Flyback modes.

Since the forward mode converter is a system that performs power transmission to the output side during ON period of switching transistor, it is possible to work with the large output current. Consequently, forward converter method is suitable to large current output with relatively lower output voltage.

To the contrary, Flyback mode converter is a system that input power is stored within the Inductor or primary coil in the transformer as a magnetic energy during ON period of switching transistor and the stored energy transmit to output side during OFF period of switching transistor. Accordingly, Flyback mode converter is suitable to high voltage and low current output, and does not suite to large current output.

#### • The stored energy within the inductor.



Energy stored in the inductor Lp is  $W = \frac{1}{2} \times LP \times IP^2 \times [J]$ 

when Ip is a triangular wave, and electric power (energy per unit time) is

$$P = \frac{[J]}{[S]} = \frac{1}{2} \times L_P \times I_P^2 \times f[W]$$

Where.

Lp: Inductance of primary winding

Ip: Peak value of primary current

f: Switching frequency

#### · How to decide primary inductance (Lp)?

(1) When the self-excited flyback system is selected:

Using the formula 
$$P = \frac{1}{2} \times L_P \times I_P^2 \times f[W]$$
,

it is possible to calculate the inductance value needed for the desired output P under the fixed Ip value.

By deriving  $E \times Ton = LP \times i$  from the formula

$$E = LP \times \frac{di}{dt}$$
,

the current which flows through the inductor becomes  $i = \frac{E \times Ton}{LP}$ .

By substituting this with P= ...., the formula of

$$P = \frac{1}{2} \times LP \times \left(\frac{E \times Ton}{LP}\right)^{2} \times f = \frac{1}{2} \times \frac{E^{2} \times Ton^{2}}{LP} \times f \text{ results.}$$

From this, the formula 
$$LP = \frac{E^2 \times Ton^2}{2 \times P} \times f$$
 results.

Where,

E: Input voltage

Ton: On time

F: Switching frequency

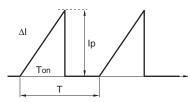
In actual designs this value is to be slightly lowered in consideration of the transformer's efficiency.

(2) When the separately-excited flyback system is selected: The coefficient k is added because a direct current is superimposed on the primary current waveform.

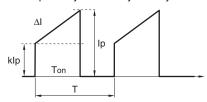
$$LP = \frac{E^2 \times Ton^2}{2 \times P} \times f \times \frac{(1+k)}{(1-k)}$$

#### The primary current waveforms

The self-excited flyback system(RCC)



The separately-excited flyback system





#### · How to decide number of turns of primary winding?

$$N_{P} = \frac{E \text{ min.} \times \text{Ton max.}}{\Delta B \times A \times (1-k)}$$

Where,

E min.: Lower limit value of input voltage (Vdc)

A: Core cross section area (m2)

D: Duty ratio

Ton max.: The maximum ON time for switching transistor (sec.)

Δ: Operating flux density (T)

#### (1) When the self-excited flyback system is selected:

$$N_P = \frac{E \text{ min.} \times T_{on max.}}{\Delta B \times A} \text{ (Ton max.} = \frac{D}{f} \text{)}$$

#### (2) When the separately-excited flyback system is selected:

$$NP = \frac{E \text{ min.} \times \text{Ton max.}}{\Delta B \times A \times (1-k)}$$

Precautions must be taken as the upper limit value of  $\Delta B$  changes according to core materials, operating temperatures, frequencies, etc.

#### · Determining of secondary winding

**ON-OFF** mode

As it is necessary to consider the voltage drop of the rectifier diode on the secondary side,

$$Ns = NP \times \frac{V_0 + V_F}{E \text{ min.}} \times \frac{1 - D}{D}$$

Where,

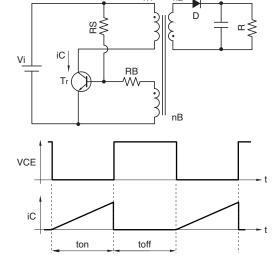
Vf: Voltage drop of the rectifier diode

Vo: Output voltage

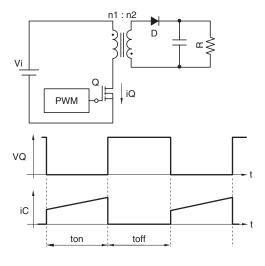
$$\frac{\text{Ton max.}}{1/\text{f}} = D : \text{Duty ratio}$$

#### • Example of drive waveforms

#### (1) When the self-excited flyback system is selected (RCC)



(2) When the separately-excited flyback system is selected



## In order for designing the transformer, the following conditions are necessary.

It is greatly appreciated customer give us those conditions by filling out required information with the appended "Transformer specifications / inquiry form".

(1)Circuit topology

Flyback system, forward system, etc.

(2) Used IC

Design with a high degree of perfection is possible when IC manufacturer and model number information are provided.

(3)Input voltage range

The lower limit of rectified voltage is important, in particular.

(4) Operating frequency (fixed/variable)

It is especially necessary to determine the lower limit frequency for the maximum load condition in Flyback converter.

(5) Maximum duty ratio

It is necessary to specify maximum ON time when input voltage is lower limit, approximately 45% should be the maximum for external excitation system.

(6)Operating temperature range,maximum temperature rise

This is the allowable temperature rise in the transformer, should be
equal to the value that ambient temperature has been taken from
the temperature index of the materials which is 120°C(105°C in UL
system).

(7)Required safety regulations

Structures and materials are chosen to comply with required safety regulations.

(8)Output voltage/current

Required for determination of the winding ratios and wire gage.

(9) Transformer outside dimension

It is necessary for determining the shape.

(10)Instructions concerning circuit designs and pin configuration of transformer

Type of the secondary rectifier diode is important in particular because of voltage drop between First recovery and Schottky barrier type is different, it will affect to design of number of turns of transformer.



Add	Iress									
Dep	artment, applicant's name(Including	the sample-sen	nding destination	on)						
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TEL	/FAX:				Ü	m Sales Promoti				
E-m	ail:			Perso	n in Charge fror	m Sales Dep.: _			Recorded D	ate / /
Circ	uit system			Proto	ype No:				Recorded D	ate / /
Inpu	ut specifications									
A	C input voltage: Rated	(V) to	(V)		Operating ra	ange:	(V) to		(V)	
D	C input voltage: Rated	(V) to	(V)		Operating ra	ange:	(V) to		(V)	
Out	put voltage/Current/Diode used (dio	de voltage drop	)							
	Output specifications	Example	Output1	Output2	Output3	Output4	Output5	Output6	Output7	VCC
	Power application	Motor								
	Output voltage(V) (Accuracy)	50V (±5V)								
€	Minimum	0								
Output Current(A)	Typical ∆T measuring condition	0.8								
put C	Maximum time	1A,10sec.								
omt	Peak time	2A, 3sec.								
	Primary/Secondary	Secondary								
	Feedback	No FRD								
	Rectifier diode VF(V)	0.1								
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<sup>•</sup> All specifications are subject to change without notice.



Name:  TEL/FAX:  E-mail:  Circuit system  Flyback method  C used  IC maker  IC drive method  Max. duty  Other input capacit  (If not specified, desi Input/output cond  Input  Output1  Output2  Output3  Output4  Output6  Example1  Example2  (Rectifier diode F.R.I.  Request for connect  Outer dimensions  Max. height  Environment  Operating temperatu  Safety standard Cstandard Elinsulation type  Pollution degree  Safety distance  Reference: creepi  Applica  Withstand voltage  Ine voltage (v)  Operating voltage  Withstand voltage  Primary - seconda  Primary - core:	od □Forward □Fixed frequen citor □ sign will be perfor	I method	Provided Frequence  %  μF ( )μFx4, which is times g  max.  max.  max  y  ry  Yes  No	Person in C Person in C Person in C Prototype N  Ty method(RCC)  greater than the output  Vac Voltage(V) 2T m	IC model No.  Drive frequency  Or Max. on-time	:		μ\$	
Name:  TEL/FAX:  E-mail:  Circuit system  Flyback method  C used  IC maker  IC drive method  Max. duty  Other input capacit  (If not specified, desi Input/output condit Input  Output1  Output3  Output4  Output5  Output6  Example1  Example2  (Rectifier diode F.R.I.  Request for connect  Outer dimensions  Max. height  Environment  Operating temperatu  Safety standard Cstandard  Insulation type  Pollution degree  Safety distance  Reference: creepin  Applica  in condition of the co	□Fixed frequencitor seign will be perforedition min. Specifications	inethod Other  or method (PWM)  or med using a value of  Vac  Vdc  Primary/Seco output  Secondar  Primary	Prs	Person in C Person in C Person in C Prototype N  Ty method(RCC)  greater than the output  Vac Voltage(V) 2T m	IC model No	Idwide transformers, ar	d an output po	Recorded Date Recorded Date  pus  pus  pus  pus  pus  pus  pus  pu	/ transforme
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E-mail:  Circuit system  Flyback method  IC used  IC maker  IC drive method  Max. duty  Other input capacit  (If not specified, desi  Input/output condi  Input  Output1  Output2  Output3  Output4  Output5  Output6  Example1  Example2  (Rectifier diode F.R.I.  Request for connect  Outer dimensions  Max. height  Environment  Operating temperatu  Safety standard Ele  Insulation type  Pollution degree  Safety distance  Reference: creepie  Applica  Insulation type  Withstand voltage  Primary - seconda  Primary - seconda  Primary - core:  (Please enter the  Mass production	Fixed frequent citor seign will be perforted in min. Specifications	rmed using a value of  Vac Vdc  Primary/Seco output  Secondal Primary	Uvariable frequence % μF ( )μFx4, which is times g max. max.  max  rimax  rimax  y y y y y y y y y y y y y y y y y y	Person in C Prototype N  by method(RCC)  greater than the output  Vac f Vdc  Voltage(V)_T m	IC model No	Idwide transformers, ar	d an output po	Recorded Date Recorded Date  pus  pus  pus  pus  pus  pus  pus  pu	/ transforme
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Flyback method  IC used  IC used  IC maker  IC drive method  Max. duty  Other input capacit  Input/output condition  Output1  Output2  Output3  Output4  Output5  Output6  Example1  Example2  (Rectifier diode F.R.I.  Request for connect  Outer dimensions  Max. height  Environment  Operating temperat  Ambient temperatu  Safety standard Cstandard Insulation type  Pollution degree  Safety distance  Reference: creepii  Applica  Insulation type  Ollution degree  Safety distance  Reference: creepii  Applica  Withstand voltage  Insulation type  Operating voltage  Withstand voltage  Primary - core: (Please enter the  Mass production	Fixed frequent citor seign will be perforted in min. Specifications	rmed using a value of  Vac Vdc  Primary/Seco output  Secondal Primary	Uvariable frequence % μF ( )μFx4, which is times g max. max.  max  rimax  rimax  y y y y y y y y y y y y y y y y y y	y method(RCC)  greater than the output  Vac  Voltage(V)  T m	IC model No.  Drive frequency Or Max. on-time  power for 100V and wor  Frequency  Current(A)typ.  easuring condition	ldwide transformers, ar	d an output po	μS wer of ( )μF for 200V Diode	/ transform
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IC drive method  Max. duty  Other input capacit  (if not specified, desi  Input/output cond  Input  Output1  Output2  Output3  Output4  Output5  Output6  Example1  Example2  (Rectifier diode F.R.I.  Request for connect  Outer dimensions  Max. height  Environment  Operating temperatu  Safety standard  Standard  Insulation type  Pollution degree  Safety distance  Reference: creepi  Applica  Insulation type  Pollution degree  Safety distance  Reference: creepi  Applica  Withstand voltage  Primary - seconda  Primary - core :  (Please production	citor	Vac Vdc Primary/Seco output  Secondar	max	vac f Vdc Voltage(V)  T m	Drive frequency Or Max. on-time  power for 100V and wor  Frequency  Current(A)typ.  easuring condition	ldwide transformers, ar	d an output po	μS wer of ( )μF for 200V Diode	/ transform
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Output2 Output3 Output4 Output5 Output6 Example1 Example2 (Rectifier diode F.R.I. Request for connect Outer dimensions Max. height Environment Operating temperat Ambient temperatu Safety standard Ell Insulation type Pollution degree Safety distance Reference: creepii Applica Insulation type Output on degree Safety distance Withstand voltage Primary - seconda Primary - seconda Primary - core : (Please enter the Mass production		output Secondar	ry Yes	50V(±5V)	easuring condition	Current	A/max.	forward voltage VF(V)	
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Rectifier diode F.R.I. Request for connect Outer dimensions Max. height Environment Operating temperat Ambient temperatu Safety standard Standard Insulation type Pollution degree Safety distance Reference: creepi Applica ine voltage (iv) Operating voltage Withstand voltag Primary - seconda Primary - core : (Please enter the Mass production		-			-	1.0A(1	0sec.)	0.7V(SBD)	
Request for connect Outer dimensions Max. height Environment Operating temperat Safety standard Cstandard Ellinsulation type Pollution degree Safety distance Reference: creepi Applica Ground voltage line voltage (V) Operating voltage Withstand voltage Primary - seconda Primary - core : (Please enter the Mass production	IC Vcc	/ Diode, S.B.D: Schottk		15V(±2V)	0.05A	0.0	5A	1.0V(FRD)	
Pollution degree Safety distance  Reference: creepii Applica II Ground voltage line voltage (V) Operating voltage Withstand voltag Primary - seconda Primary - core : (Please enter the Mass production	•	nces and Material S	afety Act, Appendix 8	□UL60335-1	□IEC 60335-1 Ed4				
Reference: creepin  Applica  I Ground voltage line voltage (V)  Operating voltage  Withstand voltag  Primary - seconda  Primary - core: (Please enter the  Mass production	☐Basic in:	sulation Rein	forced insulation						
Reference: creepii Applica I Ground voltage line voltage (V) Operating voltage Withstand voltag Primary - seconda Primary - core: (Please enter the Mass production			t specified, design will b	e performed with a p					
Applica  Ground voltage line voltage (V)  Operating voltage  Withstand voltag  Primary - seconda  Primary - core:  (Please enter the  Mass production		econdary :		Primary - primary				ary :	
Applica  Ground voltage line voltage (V)  Operating voltage  Withstand voltag  Primary - seconda  Primary - core:  (Please enter the  Mass production	Primary - co		mm	Secondary - core		mm (Please	enter the dist	tance prescribed by the	ne compa
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Ground voltage line voltage (V)  Operating voltage  Withstand voltag  Primary - seconda  Primary - core :  (Please enter the  Mass production	cable safety standa	ards	Appe	endix 8			Ed.4		
line voltage (V)  Operating voltage  Withstand voltag  Primary - seconda  Primary - core :  (Please enter the  Mass production	Insulation class		Base	Enhancement		Base		Enhancement	
Operating voltage  Withstand voltag  Primary - seconda  Primary - core: (Please enter the  Mass production	le oi	50 < x ≦ 150	2.0	4.0		n level2 CTI		Pollution level2 CTI	
Withstand voltag Primary - seconda Primary - core : (Please enter the Mass production		50 < x ≤ 300 25 < x ≤ 250	2.5	5.0	I	II IIIa/t	) I	п —	Ⅲa/b 5.0
Primary - seconda Primary - core : (Please enter the Mass production	ae (V)	50 < x ≦ 400			2.0	- 4.0	4.0		8.0
Primary - secondal Primary - core : (Please enter the Mass production	age		-				1		
Primary - core :		Vac	min Primary - p	rimary :	Vac n	nin Secondary - sec	ondary :	Vac	
Mass production	•	Vac	min Secondary	- core :	Vac n	nin	· —		
	dary :	cribed by the compa							
Final set name:	dary:	ing information							
=	dary :		Asking pri	ce		Planned	amount		
Approval location	dary :			ocation			terms CIF-		
	dary : ne distance prescon and prototyp		Test production2		est production for Mas			Mass production	
Necessary sample Request Items (En	ne distance prescon and prototyp		n request such as priorit		equested delivery time				
nequest items (En	dary : ne distance prescon and prototyp  n Test production1 uples Amount		o request such as priorit	y conunions, size, pri	ce, or adjustable items	o. <i>j</i>			
	dary : ne distance prescon and prototyp  n Test production1 uples Amount								
	dary : ne distance prescon and prototyp  n Test production1 uples Amount								
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