SMD Transformers

E13 EMHV series

Series/Type: **B78308*A003**
Ordering code:

Date: May 2022

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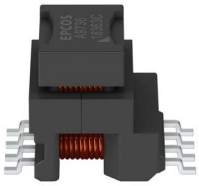


Construction

- Ferrite core MnZn
- SMD gullwing pins
- Triple insulated wire class F (155 °C)
- Non-conductive pick-and-place cap on top

Features

- Height: 11.6 mm max
- Footprint: 16.2 mm x 13.4 mm
- Plastic Bobbin CTI IIIa class material
- Wide temperature range from –40 °C up to +150 °C
- Qualified to AEC-Q200
- RoHS compatible

Applications

- Isolated DC/DC converters

Insulation characteristics

- PRI / SEC (Cumulative): Creepage ≥ 11.2 mm, Clearance ≥ 8.14 mm
- Core / Top surface: Creepage and Clearance ≥ 3.25 mm
- PRI / core: Creepage ≥ 7.5 mm, Clearance ≥ 5.1 mm
- SEC / core: Creepage ≥ 3.7 mm, Clearance ≥ 3.05 mm
- Insulation distances sufficient for basic insulation according to IEC 60664-1, 61558-2-16 for working voltage 1000 V DC, Transient over voltage 2500 V_{Peak}, P2, CTI IIIa, 5000 m altitude.
- Insulation distances sufficient for reinforced insulation according to IEC 60664-1, 61558-2-16 for working voltage 300 V, P2, OVC II, CTI IIIa, 2000 m altitude.

Marking

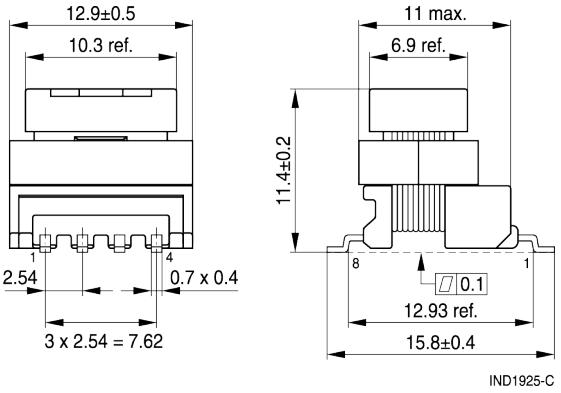
- Product brand, middle block of ordering code, date code, pin 1 marker, production place identification code

Delivery mode

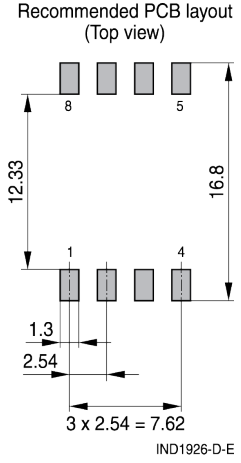
- Tape and reel 13” diameter
- Packing unit: 190 pcs per reel

Dimensional drawing and recommendation

Dimensions in mm



Recommended PCB layout (Top View)



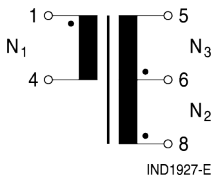
Flyback Topology applicable Transformer Product parameters

Characteristics and ordering code: specified at +25 °C if not mentioned otherwise, all values without tolerances are typical values.

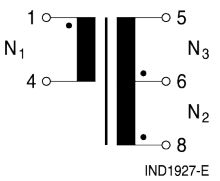
	Units	Ordering codes	
		B78308A2461A003	B78308A2462A003
Reference Schematic		F1	F2
Turns ratio		1 : 0.22 : 0.78	1 : 0.33 : 0.67
Typical operational frequency	kHz	100 ... 400 kHz	
L_{N1} (1-4) at 100 kHz, 10 mV	µH	4.1 ±10%	4.1 ±10%
LL, N1 (1-4) at 100 kHz, 10 mV	nH	330 short 5, 6, 8	300 short 5, 6, 8
R_{DC}, N1	mΩ	100	100
R_{DC}, N2	mΩ	50	75
R_{DC}, N3	mΩ	150	130
Saturation Current I_{SAT}, N1 at T ≤+150 °C, L=Lo-20%	A	4	4
Typical diagram for L_{N1} saturation		G1	
High Voltage Test Routine test: 50 Hz, 1 sec	V AC	3000 (N1) / (N2,N3)	
High Voltage Test Type test: 50 Hz, 1 min	V AC	3750 (N1) / (N2,N3)	
Partial discharge inception voltage, Type test	V_{PEAK}	1500 (N1) / (N2,N3)	
Partial discharge extinction voltage, Type test	V_{PEAK}	1200 (N1) / (N2,N3)	
Surge voltage Test Type test		6 kV peak; 1.2/50 µs, (N1) / (N2,N3)	
Recommonded IC		L9502 – STMicroelectronics	

Schematics and saturation graph

F1

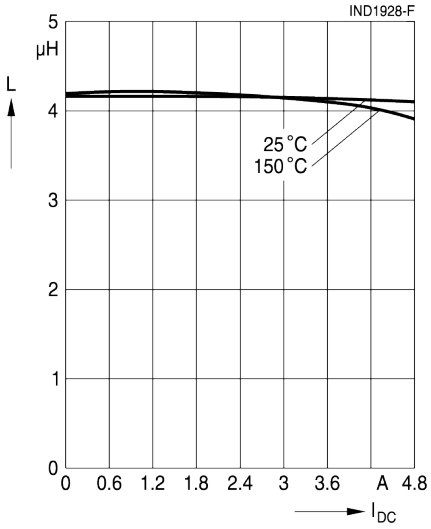


F2



B78308A2461A003 and B78308A2462A003 - Saturation at different temperatures (typical curves)

G1



Push Pull / Half Bridge topology applicable Transformer Product parameters

Characteristics and ordering codes: specified at +25 °C if not mentioned otherwise, all values without tolerance are typical values.

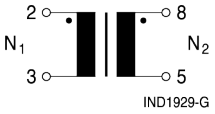
	Units	Ordering codes		
		B78308A2387A003	B78308A2484A003	B78308A2485A003
Reference Schematic		F3	F3	F4
Turns ratio		1 : 1.07	1 : 1.07	1 : 1 : 0.57 : 2.14
Typical operational frequency	kHz	100 ... 400 kHz		
L_{N1} (min) at 100 kHz, 100 mV	µH	100	90	90 short (2, 3)
LL, N1 at 100 kHz, 100 mV	µH	0.8 short 8-5	2.6 short 8-5	1.1 short (2, 3) & 5, 6, 7, 8
C_P at 20 kHz, 1 V	pF	9 (N1 / N2)	2 (N1 / N2)	6 (N1,N2) / (N3,N4)
R_{DC}, N1	mΩ	260	260	175
R_{DC}, N2	mΩ	350	350	175
R_{DC}, N3	mΩ	–	–	85
R_{DC}, N4	mΩ	–	–	280
Voltage Time Product V x Unipolar, B_{max} = 220 mT	µVs	15	15	25
Voltage Time Product V x Unipolar, B_{max} = 440 mT	µVs	30	30	50
High Voltage test Routine test: 50 Hz, 1 sec	V AC	3000 (N1 / N2)	3000 (N1 / N2)	3000 (N1,N2) / (N3,N4)
High Voltage Test Type test: 50 Hz, 1 min	V AC	3750 (N1 / N2)		3750 (N1,N2) / (N3,N4)
Partial discharge incep-voltage, type test	V_{PEAK}	1500 (N1 / N2)		1500 (N1,N2) / (N3,N4)
Partial discharge extinc-voltage, type test	V_{PEAK}	1200 (N1 / N2)		1200 (N1,N2) / (N3,N4)

Other characteristics

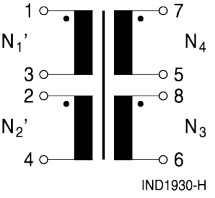
Storage conditions		–25 °C ... +40 °C, humidity ≤75% RH
Climatic category		40/150/56 (to IEC 60068)
Resistance to reflow soldering heat		In accordance with JEDEC J-STD-020D T_{peak} = +245 °C (T_{peak} –5 °C for 30 seconds)
Operating temperature range		–40 °C ... +150 °C (component)
Weight		Approx. 2.5 g

Referenced Schematics

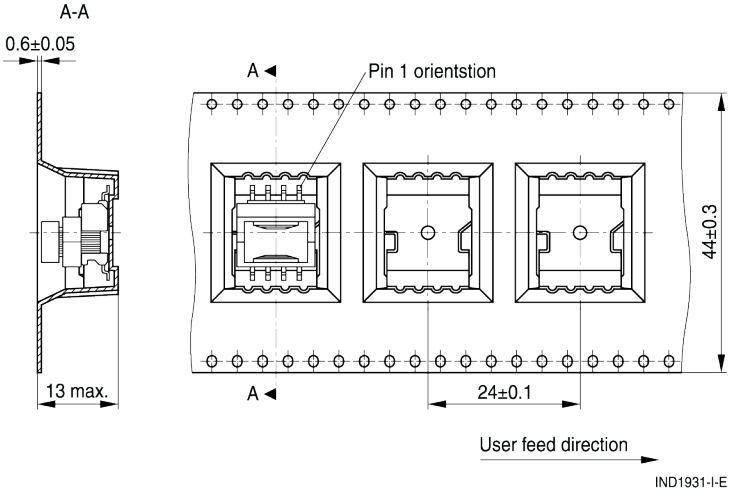
F3



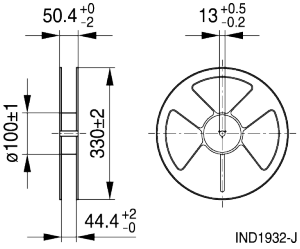
F4



Blister tape

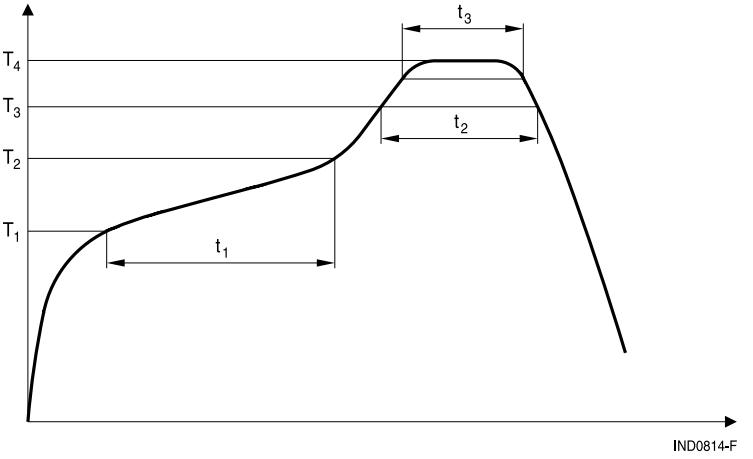


Reel



Recommended reflow soldering curve

Pb-free solder material (based on JEDEC J-STD 020E)



T_1 °C	T_2 °C	T_3 °C	T_4 °C	t_1 s	t_2 s	t_3 s
150	200	217	245	60 – 120	60 – 150	< 30 at T_4 –5 °C

Time from +24 °C to T_4: max. 480 s

Maximal numbers of reflow cycles: 3

Cautions and warnings

- Please note the recommendations in our Inductors data book (latest edition) and in the data sheets.
  - Particular attention should be paid to the derating curves given there.
  - The soldering conditions should also be observed. Temperatures quoted in relation to wave soldering refer to the pin, not the housing.
- If the components are to be washed varnished it is necessary to check whether the washing varnish agent that is used has a negative effect on the wire insulation, any plastics that are used, or on glued joints. In particular, it is possible for washing varnish agent residues to have a negative effect in the long-term on wire insulation.
  Washing processes may damage the product due to the possible static or cyclic mechanical loads (e.g. ultrasonic cleaning). They may cause cracks to develop on the product and its parts, which might lead to reduced reliability or lifetime.
- The following points must be observed if the components are potted in customer applications:
  - Many potting materials shrink as they harden. They therefore exert a pressure on the plastic housing or core. This pressure can have a deleterious effect on electrical properties, and in extreme cases can damage the core or plastic housing mechanically.
  - It is necessary to check whether the potting material used attacks or destroys the wire, wire insulation, plastics or glue.
  - The effect of the potting material can change the high-frequency behaviour of the components.
  - Many coating materials have a negative effect (chemically and mechanically) on the winding wires, insulation materials and connecting points. Customers are always obligated to determine whether and to what extent their coating materials influence the component.
    Customers are responsible and bear all risk for the use of the coating material. TDK Electronics does not assume any liability for failures of our components that are caused by the coating material.
- Ceramics / ferrites are sensitive to direct impact. This can cause the core material to flake, or lead to breakage of the core.
- Even for customer-specific products, conclusive validation of the component in the circuit can only be carried out by the customer.

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