

SMT current sense transformers


EP7 Core

Series/Type: B78417
Date: September 2022

Construction

- Ferrite core
- Primary winding: frame molded in
- Secondary winding: copper wire
- Creepage distance Np/(Ns, core) 5 mm
- Clearance distance Np/Ns (CuL) 3.2 mm
- Clearance distance Np/core 3.5 mm
- Plastic bobbin (UL94-V0, CTI \geq 175)


Features

- Very low DC resistance
- Different turn ratios
- Small SMD package
- RoHS compatible
- Qualified to AEC-Q200
- Insulation distances in compliance with IEC 60664 (Basic insulation, working voltage RMS 500 V)
- UL 1446 Class 155 (F) electrical insulation system 

Applications

- Switch-mode power supplies
- Feedback control
- Overload sensing
- Load drop/shut down detection

Terminals

- SMD L-Pins

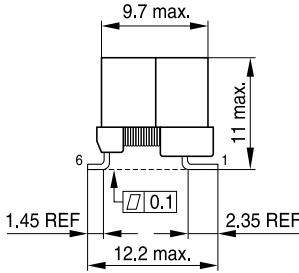
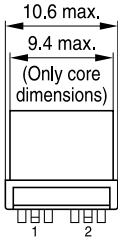
Marking

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

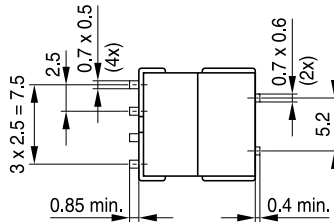
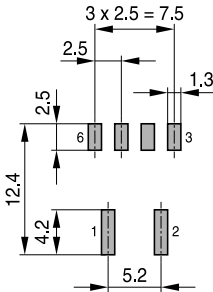
Delivery mode and packing units

- Blister tape
- Packing unit: 320 pcs. / reel

Dimensional drawing

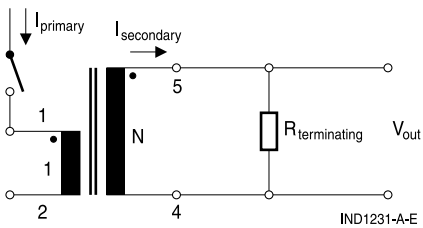


Recommended PCB layout (Top view)



IND1573-Y-E

Application circuit and pinning



IND1231-A-E

Technical data and measuring conditions

All data is specified at +25 °C if not mentioned otherwise. All values without tolerance are typical values.

Frequency range	50 ... 500 kHz
High voltage test	2400 V AC, 50 Hz, 1 s (winding to winding), type test 60 s
Inductance L (5-4)	Measured at 20 kHz, 10 mV, +25 °C
DC resistance R_{\max} (1-2)	Measured at +25 °C
DC resistance R_{\max} (5-4)	Measured at +25 °C
Sensed current $I_{\text{prim, RMS}}$	The max. primary current of 20 A causes approx. +40 °C temperature rise
Couple capacitance C_p (1-5)	Measured at 10 kHz, 1 V, +25 °C
Solderability	≥ 99.9 Sn, lead-free. or Sn96.5Ag3.0Cu0.5: +(245 ±5) °C, (3 ±0.3) s Wetting of soldering area ≥ 95% (to IEC 60068-2-58)
Resistance to soldering heat	In accordance with JEDEC J-STD-020D +245 °C (T_{peak} -5 °C for 30 s)
Storage conditions (packaged)	-20 °C ... +40 °C, ≤ 75% RH
Operating temperature range	-40 °C ... +150 °C
Pollution degree	P2 (to IEC 61558-1, IEC 60664)
Insulation thermal class	+155 °C (F) (to IEC 60085)
Weight	Approx. 2.5 g

$$B_{max} = \frac{V_{out,max} \cdot \delta_{max}}{N_s \cdot A_e \cdot f_{osc}}$$

With:

B_{max}	Maximum magnetic flux density in the ferrite core of the current sense transformer
$V_{out,max}$	Maximum output voltage of the measurement signal
δ_{max}	Maximum duty cycle
N_s	Number of turns of the secondary winding of the current sense transformer
A_e	Effective magnetic area of the ferrite core
f_{osc}	Operating frequency of the switching operator IC
Typical value for A_e :	$10.7 \times 10^{-6} \text{ m}^2$
Typical B_{max} :	$< 220 \text{ m T}$

$$R_T = \frac{V_{out,max} \cdot N_s}{I_{IN,max}}$$

With:

R_T	Resistance of burden resistor
$V_{out,max}$	Maximum output voltage of the measurement signal
N_s	Number of turns of the secondary side of the CST
$I_{IN,max}$	Maximum input current (peak current)

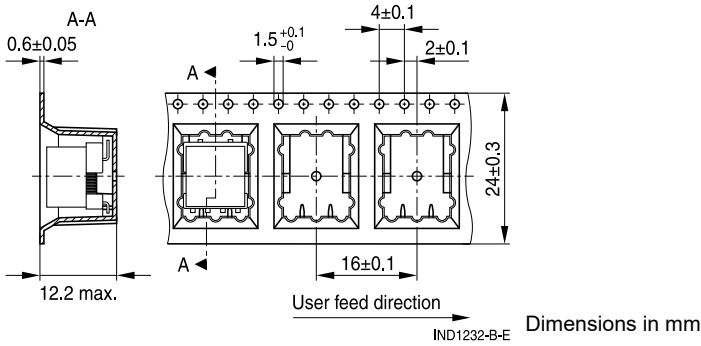
Characteristics and ordering codes

L_{min} (5-4)	Turns ratio	DC resistance R_{max} (m Ω)		Voltage-time product at $n_s^{(1)}$ V \cdot μ s	C_p pF	Recomm. $R_T^{(2)}$ Ω	Ordering code
		(1-2) primary	(4-5) secondary				
mH	$n_p : n_s$						
1.7	1 : 50	1.9	2.1	116	4	2.5	B78417A2285A003
3.0	1 : 70	1.9	2.9	163	4	3.5	B78417A2286A003
7.0	1 : 100	1.9	5.0	233	4	5.0	B78417A2185A003
11.0	1 : 125	1.9	5.3	291	4	6.0	B78417A2287A003

- 1) The maximum volt-sec rating limits the peak flux density to 200 mT when used in a unipolar drive application. For bipolar drive applications, a maximum volt-sec of two times is acceptable.
- 2) The Burden Resistor value is calculated by taking V_{out} as 1 V reference and with maximum input current (20 A) flowing through the primary winding of the current sense transformer.

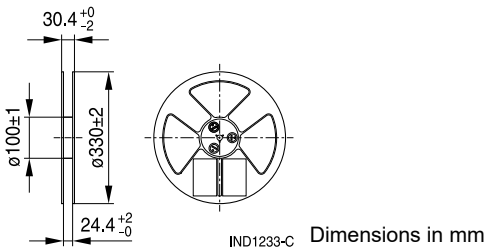
Taping and packing

Blister tape



Dimensions in mm

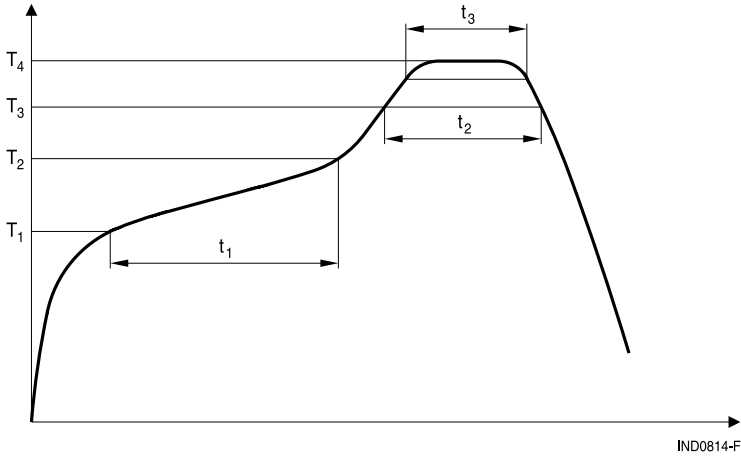
Reel



Dimensions in mm

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 sec	t ₂ sec	t ₃ sec
150	200	217	245	60 – 120	60 – 150	< 30 @ T ₄ – 5 °C

Time from 24 °C to T₄: 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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Important notes

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