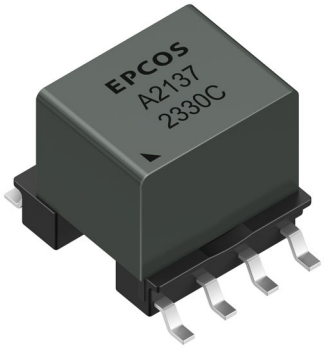
SMT Drive Transformer

EP 7 series

Series/Type:
Ordering code: **B78417A***

Date: January 2024



Construction

- Ferrite core MnZn
- SMD Gull wing pins
- Plastic bobbin UL94-V0

Features

- Maximum height 10.5 mm
- Flat inductance curve vs. wide temperature
- 2500 V RMS withstand voltage
- RoHS compatible
- Qualified to AEC-Q200

Applications

- DC/DC power supplies
- Push-pull converters
- Gate drive transformers for IGBT / MOSFET

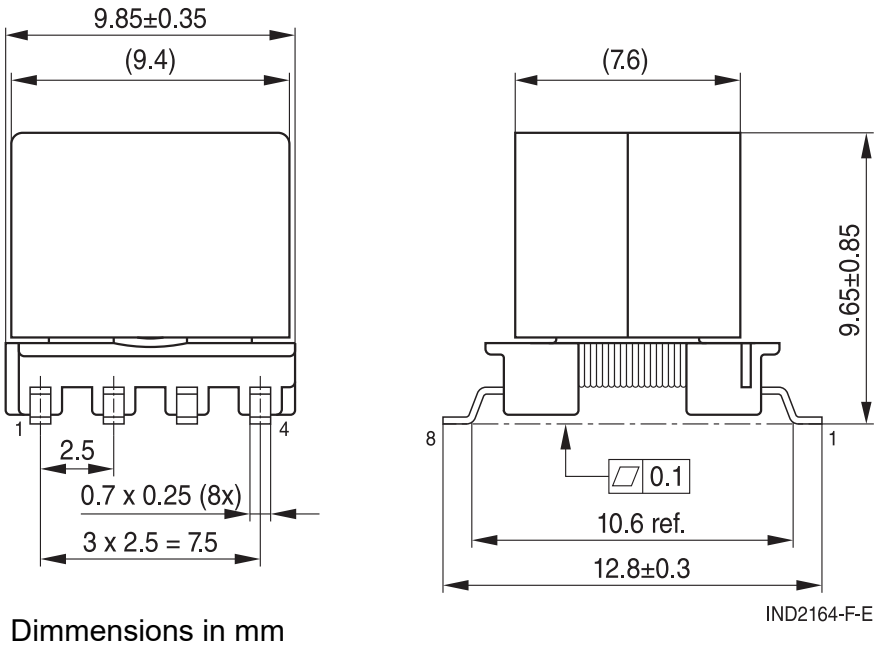
Marking

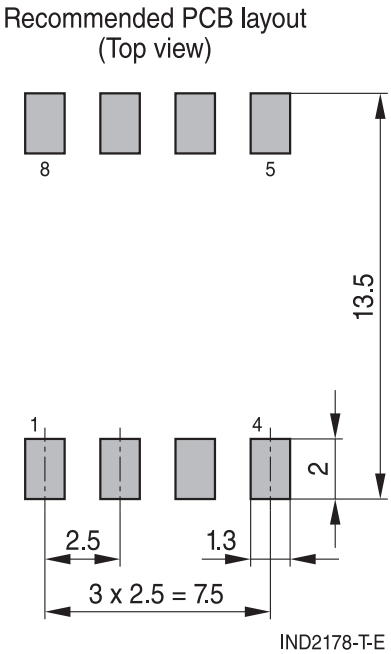
- Product brand, middle block of ordering code, date code, pin 1 marker, production place identification code

Delivery mode and packing units

- Blister tape
- Packing unit: 375 pcs. / reel

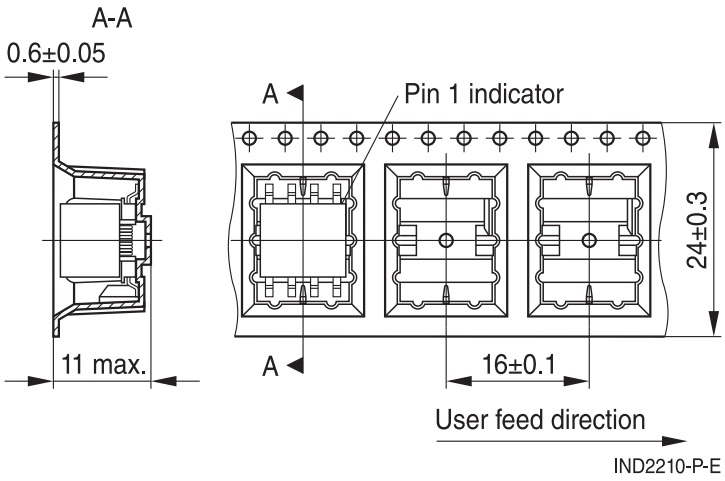
Dimensional drawing and Layout Recommendation



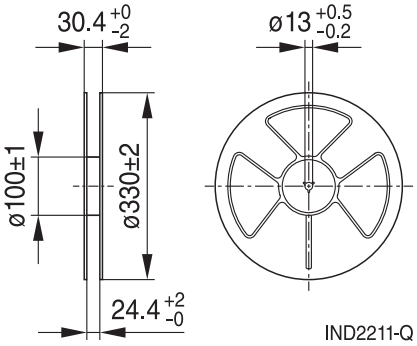


Dimmensions in mm

Blister tape



Reel



Electrical Measurement Data

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

Turns ratio	Typical operational frequency	L_{N1}		L_{LEAK}, N1	C_p	I_{RMS} (per winding)[1]	Ordering code
	kHz	Min. (µH)	Nom. (µH)	µH	pF	mA	
1 : 1	100…400	200	372	1	7	400	B78417A2371A003
1 : 1 : 1 : 1		680	1050	18	2	350	B78417A2500A003
1 : 1 : 0.55 : 0.27		1030	2300	30	3.5	200	B78417A2137A003
1 : 1 : 0.72 : 0.72		85	157	8	2	350	B78417A2372A003

1) R_{TH} value of the component is 127.5 K/W.

Continued table

Recommended IC	R_{DC},N1	R_{DC},N2	R_{DC},N3	R_{DC},N4	V · t (max, unipolar/ bipolar)[1]	Ordering code
	mΩ	mΩ	mΩ	mΩ	µVs	
LT6804	620	690	--	--	30/60	B78417A2371A003
MAX17841	450	450	450	450	55/110	B78417A2500A003
	2000	600	350	--	88/166	B78417A2137A003
SN6501	250	270	210	195	17/34	B78417A2372A003

1) T ≤150 °C, $\hat{B}$ = 200 mT, ΔB= 400 mT (bipolar mode).
The maximum volt-sec rating limits the peak flux density to $\hat{B}$ = 200 mT when used in a unipolar drive application.
For bipolar drive applications, a maximum volt-sec of two times is acceptable (ΔB 400 mT)

Referenced figures

Ref. circuit diagram	Ref. topology	Ref. Fig. Z vs I	Ref. Fig. L vs T	Ordering code
Figure 1	B2, B3	Z1	T1	B78417A2371A003
Figure 2	B1	Z2	T2	B78417A2500A003
Figure 3	B1	Z3	T3	B78417A2137A003
Figure 2	B1	Z4	T4	B78417A2372A003

High Voltage Capability Data.

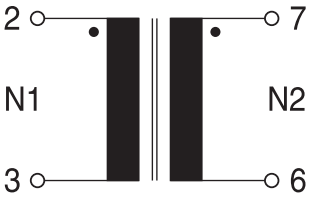
HV - Primary / Secondary Routine test: 50 Hz, 1 sec; Type test: 50 Hz, 1 min	V AC	2500
Partial Discharge Extinction Voltage Primary / Secondary Type test	V_{PEAK}	800
R iso @ 500 V DC, 1 min	MΩ	100

Storage and other characteristics.

Storage conditions (packaged)	–25 °C … +40 °C, humidity ≤ 75% RH (avg.)
Resistance to reflow soldering heat	In accordance with JEDEC J-STD-020E T_{peak} = +245 °C (T_{peak} –5 °C for 30 s)
Solderability (lead-free)	Sn96.5Ag3.0Cu0.5: +(245 ±3) °C, (3 ±0.3) s Wetting of soldering area ≥ 95% (to IEC 60068-2-58, test Td1, method 1)
Operating temperature range	–40 °C … +150 °C (component)
Weight	Approx. 2 g

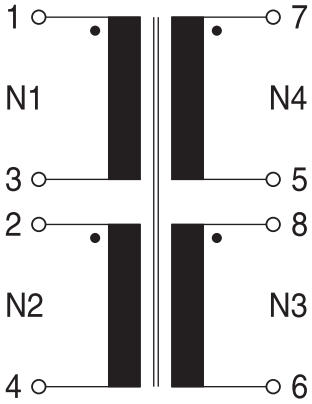
Circuit Diagram

Figure 1



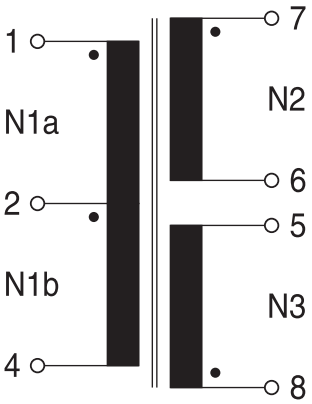
IND2181-W

Figure 2



IND2182-X

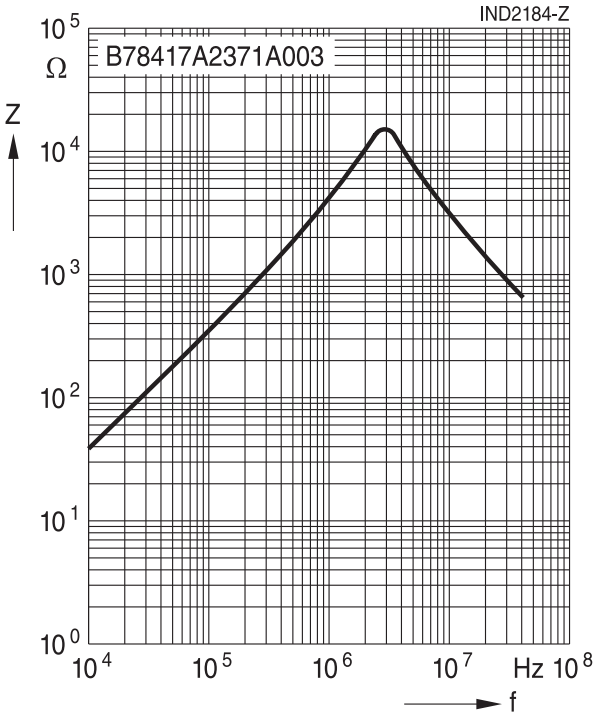
Figure 3



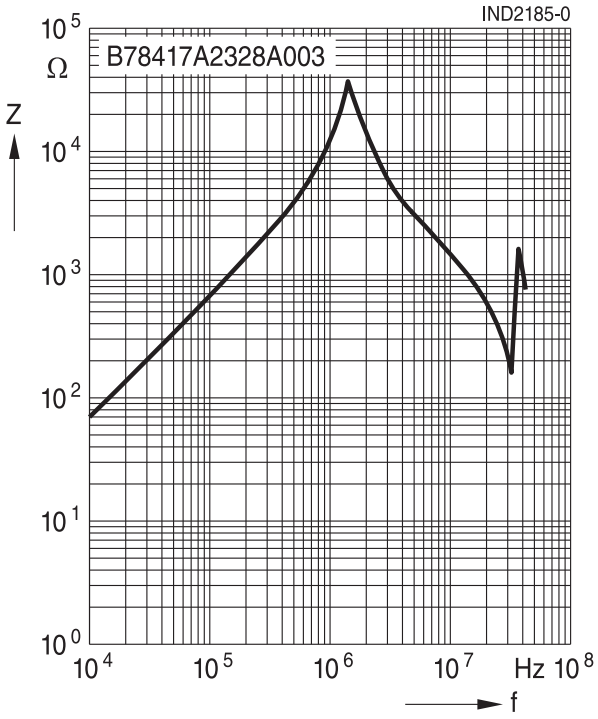
IND2183-Y

Impedance vs Frequency graphs: Impedance (N1)

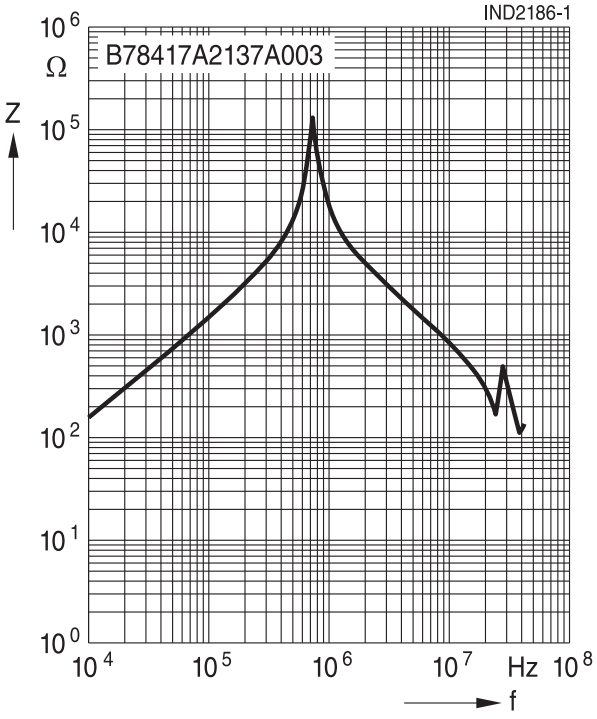
Z1



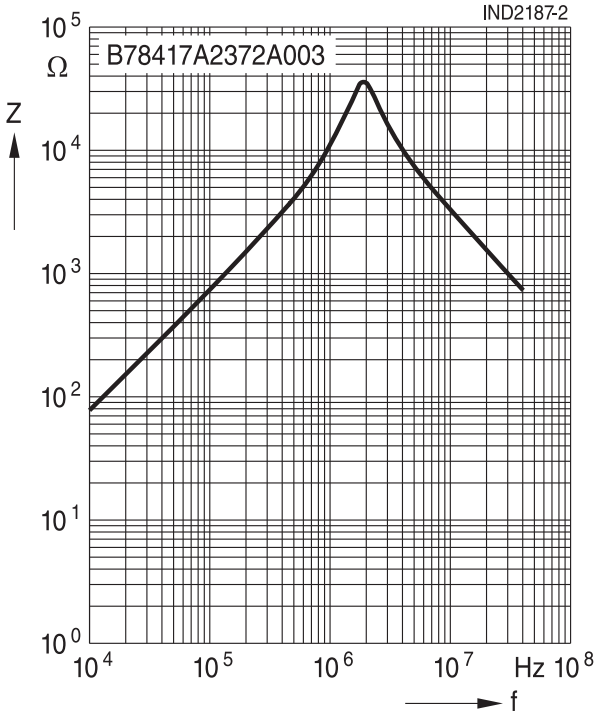
Z2



Z3

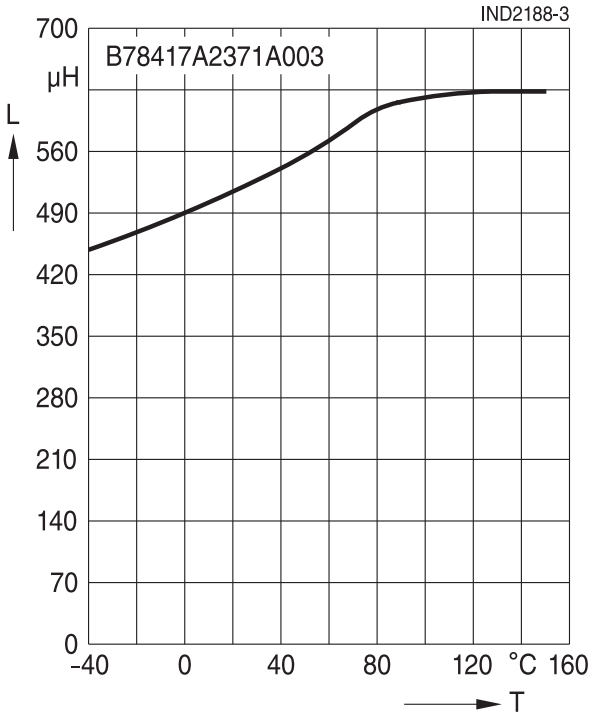


Z4

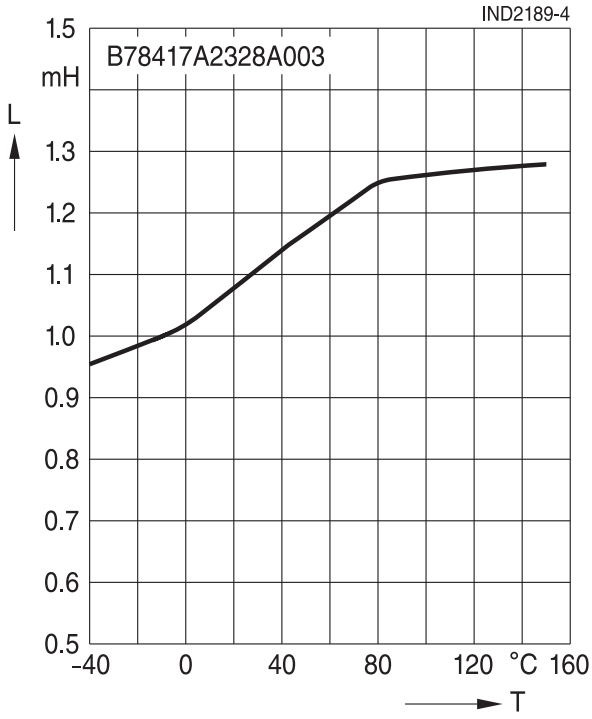


Inductance vs Temperature graphs: Inductance (N1)

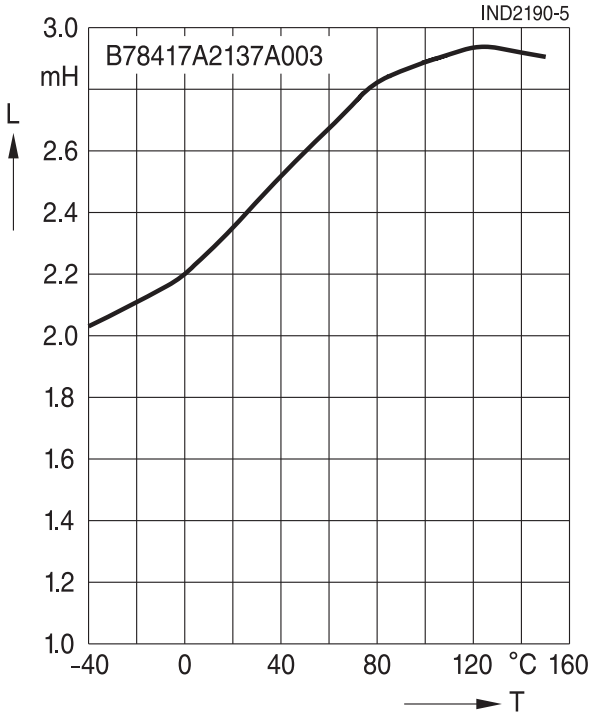
T1



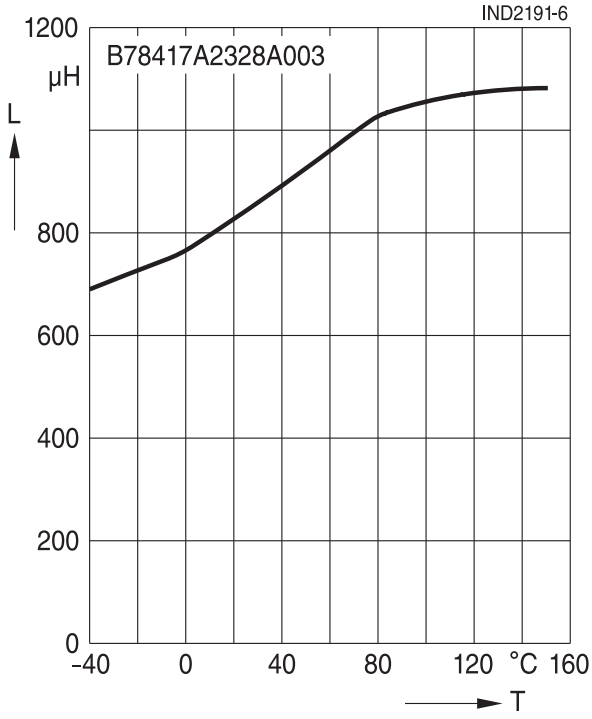
T2



T3

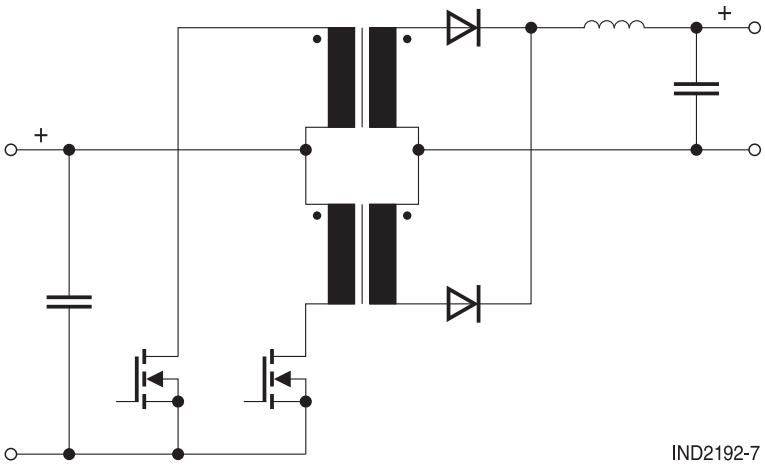


T4

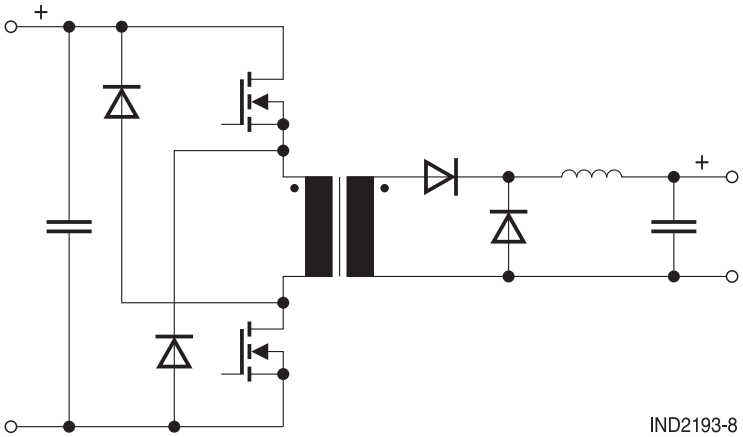


Topology examples

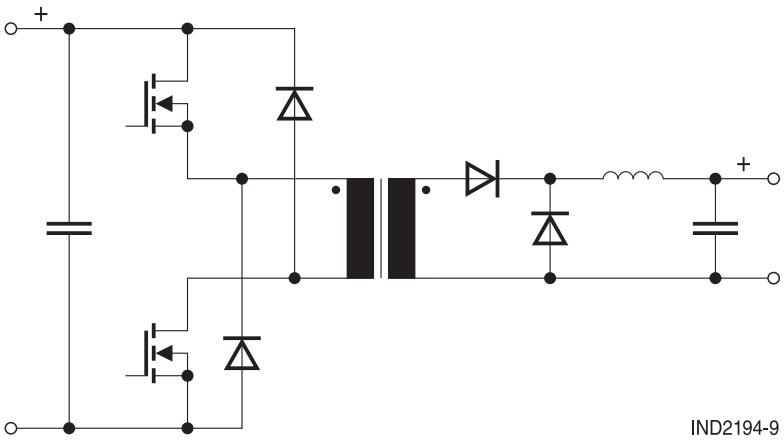
B1) Push Pull



B2) Half Bridge

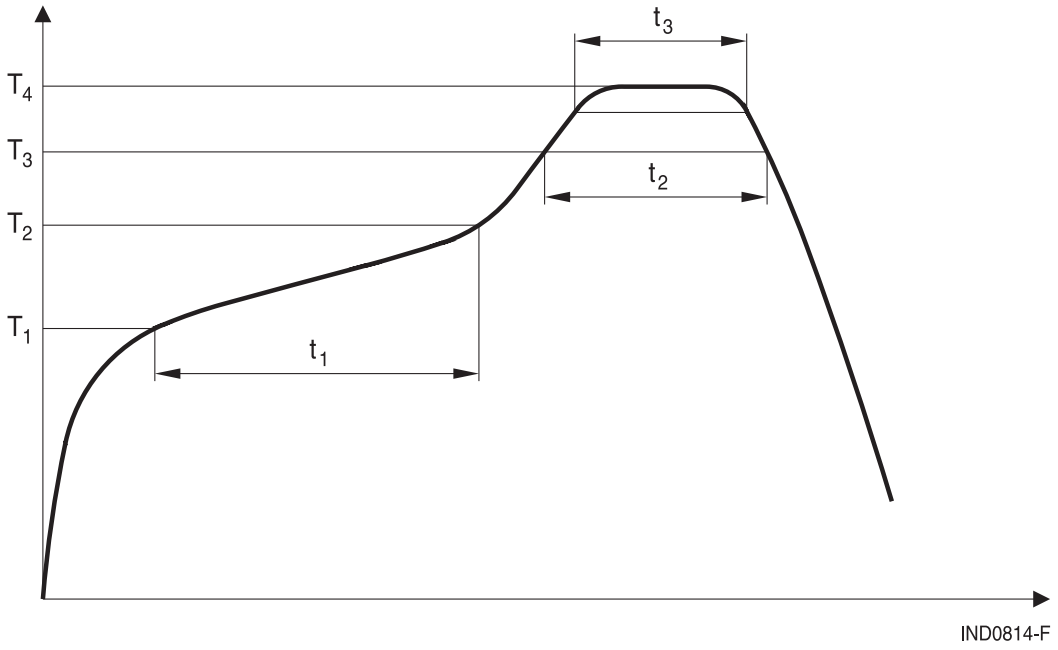


B3) Two switch Forward



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 @ T_4 –5 °C

Time from 25 °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), online catalogs and in the data sheets.
  - Particular attention should be paid to the derating curves, if given. Derating applies in the case the ambient temperature in application exceeds the rated temperature of the component.
  - Ensure the operation temperature of the component in application not to exceed the maximum specified value or the upper climatic category temperature.
  - 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. 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, sealed, or varnished in customer applications:
  - Many potting, sealing, or varnishing 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, sealing or varnishing materials used attack or destroy the wire insulation, plastics, or glue.
  - The effect of the potting, sealing, or varnishing materials may change the high−frequency behavior of the components.
- Magnetic core materials such as ferrites are sensitive to direct impact. This can cause the core material to flake or lead to breakage of the magnetic core material.
- Any type of tension or pressure on the product may result in damage and affect its functionality and reliability.
  - The products are only to be attached to fixings or mounting holes provided for this purpose in accordance with the data sheet.
  - If additional mechanical forces are applied to the component, e.g., application of gap pads, it is necessary to check whether they attack or destroy any part of the component.
  - It is not permitted for the product specified in the data sheet to assume a mechanical function in the final application.
- Inductance value can drop if external metallic or magnetic parts will be put close to the coil or into the air gap of the coil or core or magnetic material.
- Even for customer-specific products, conclusive validation of the component in the circuit can only be carried out by the customer.

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.tdk-electronics.tdk.com/orderingcodes.

■

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule, we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.

2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.

3. **The warnings, cautions and product-specific notes must be observed**.

4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.

5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.
   We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

6. Unless otherwise agreed in individual contracts, **all orders are subject to our General Terms and Conditions of Supply**.

Important notes

7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard**. The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.
8. The trade names EPCOS, CarXield, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, FilterCap, FormFit, InsuGate, LeaXield, MediPlas, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PiezoBrush, PlasmaBrush, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap, XieldCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

Release 2023-08