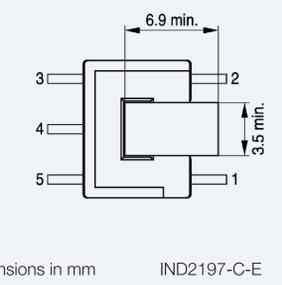
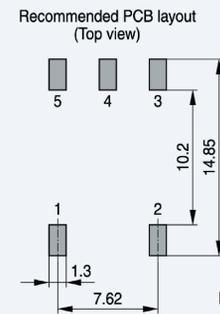
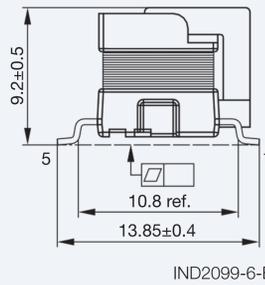
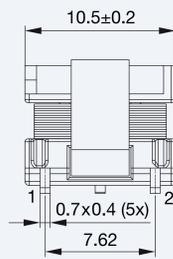
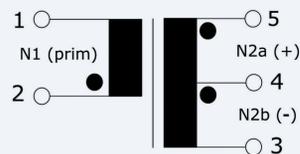


InsuGate Transformer Series

Contributes to the Latest Full Bridge Inverter Modules in EV Powertrains with a Big Step in Downsizing for 1 kV Basic Insulation

Dimensions & Electrical Features of a Gate Drive Transformer

Full bridge gate drive	B78541A2525A003
Secondary outputs [V]	+18/-5
Primary L_{N1} [μ H]	75
Primary L_{N1} [μ H]	≥ 50
$L_{leak,typ}$ [μ H]	0.7
$E \cdot dt_{N1}$ bipolar / unipolar [μ Vs]	15 / 30
Couple capacity [pF]	4
Resonance f_{N1} [MHz]	4
Possible chipset	1EDI3035AS



Construction

Primary side:
Core is at Pin 1,2 drive side

Wire:
Triple insulated wire acc. IEC 61558-1 annex K

Bobbin:
Reflow capability, operating temperature -40 to +150 °C

Secondary side:
Core embedded in center bobbin pocket
→ Pin 3, 4, 5 insulated against core and primary pin 1, 2

Bottom side:
Core embedded in bobbin & insulated

Insulation Construction According IEC 61558-1/2-16

- **Basic insulation** between primary and secondary pins
- Working voltage up to **1000 V (DC)**
- Creepage and clearance distance acc. **IEC 61558-1/2-16**
- Peak transient voltages max. 2.5 kV
- **Partial discharge test: Extinction voltage of min. 1.2 kV (peak)** between the primary and secondary side
- Pollution degree P2, at an altitude of 5500 m
- Type test acc. IEC standard: test voltage **3 kV** for 60 sec. between primary and secondary

Downsizing

B78308A2387A003

E13 EMHV
max. 16.2 x 13.4 mm
PCB space 217 mm²

30% less PCB space

→

B78541A2525A003

U 7
max. 14.25 x 10.7 mm
PCB space 152 mm²

Used PCB space downsized via max. outer dimensions

Parts with the same **1 kV (DC) basic insulation**

$U_{op} = 500 \text{ V (DC)}$

E10 EM
max. 13.5 x 11.7 mm
PCB space 158 mm²
B78307A2276A003

Doubled working voltage 1 kV (DC)

→

$U_{op} = 1 \text{ kV (DC)}$

U 7
max. 14.25 x 10.7 mm
PCB space 152 mm²
B78541A2525A003

Used PCB space similar via max. outer dimensions

Insulation upgrade to a working voltage of **1 kV (DC)**



InsuGate Transformer Series

Contributes to the Latest Full Bridge Inverter Modules in EV Powertrains with a Big Step in Downsizing for 1 kV Basic Insulation

Product Features and Applications

Product features

- Basic insulation IEC 61558-1/2-16, $U_{op,max}$ 1 kV (DC)
- Switching frequency 100 to 500 kHz
- Flat inductance versus temperature
- Couple capacity
- Resonance frequency $f_{N1,typ}$ 4 MHz
- RoHS compatible
- Qualified to AEC-Q200 rev E
- Wide temperature range -40 to +150 °C
- Height \leq 10 mm
- Weight 2 g (typ.)

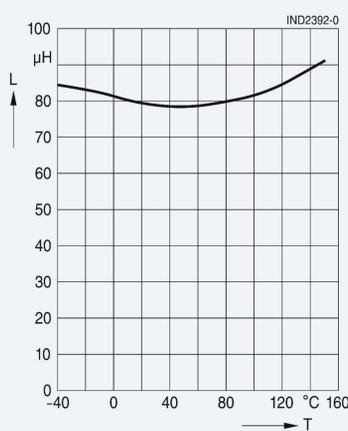
Applications

- Full bridge inverter modules with high U_{op} up to 1 kV (DC)
- Matched to gate driver 1EDI3035AS
- Gate driver circuits for Silicon IGBTs & SiC MOSFETs using the same gate drive transformer with dual output

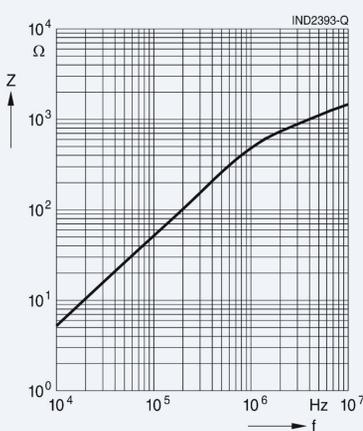


Typical Curves

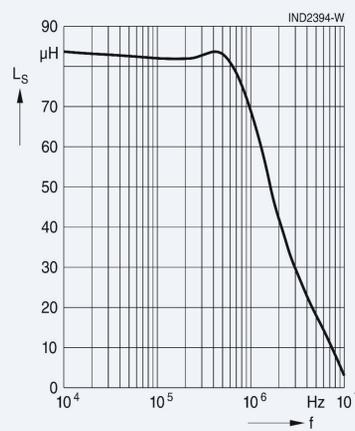
Inductance L versus temperature



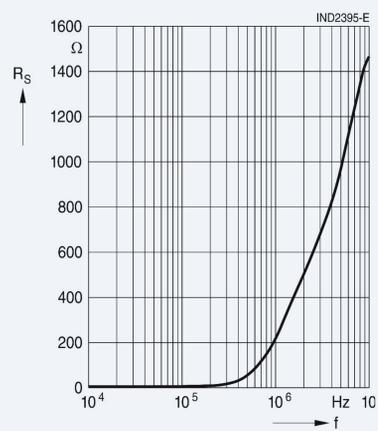
Impedance Z versus frequency f



Inductance L_s versus frequency f

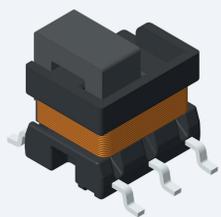


Resistance R_s versus frequency

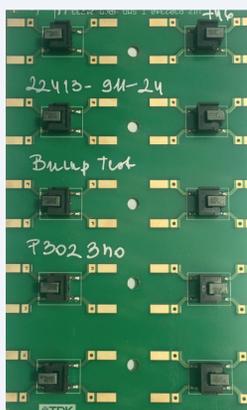


AQG 324 – Enhanced Vibration Tests Beyond AEC-Q

UI 7



2 x Output, center tap
SiC, IGBT, 1EDI3035AS
 $C_p = 4$ pF
1 kV (DC) basic insul.
IEC 61558
height 9.7 mm
weight 2 g



Accelerations and profiles for combustion and transmission mounted modules.



Temperature	T_{RT}
Frequency sweep time for sinusoidal excitation	1 octave/min, logarithmic
Vibration profile for combustion engine mounted parts	Vibration excitation, sinusoidal acc. to Figure 8.2 and Table 8.3 Vibration excitation, wide-band random vibration acc. to Figure 8.3 and Table 8.4 (RMS = 181 m/s ²)
Vibration profile for transmission mounted parts	Vibration excitation, sinusoidal acc. to Figure 8.4 and Table 8.5 Vibration excitation, wide-band random vibration acc. to Figure 8.5 and Table 8.6 (RMS = 96.6 m/s ²)

→ Passed vibration tests with standard Eurocard PCBs

These tests should be verified with final driver boards and complete assembled units with its own weight and size

Summary



- The InsuGate transformer series B78541A* can achieve a big step in downsizing single gate drive transformers within 1 kV (DC) working voltage platforms
- The dual output is matched to 1EDI3035AS using SiC MOSFETs and Silicon IGBTs

- It offers a simple use of just one part as single gate driver in modern switching concepts of newest full bridge inverter modules in EV powertrains with SiC MOSFETs and Silicon IGBTs
- InsuGate contributes a big technological step in effective switching without compromise between insulation and transformer design for single gate drivers in EV powertrains

