

Server Power Supply Circuit Products and Data Line Products

[Inductors \(Coils\)](#)[Sensors and Sensor Systems](#)[Temperature Sensors \(NTC\)](#)[Transformers](#)[Voltage Protection Devices](#)[Chip Beads](#)[Chip NTC Thermistors \(Sensor\)](#)[Chip Varistors / Ceramic Transient Voltage Suppressors](#)[Pulse Transformers and Modules for LAN](#)[μPOL™ Embedded DC-DC Converters](#)

With the spread of cloud computing and smartphones and the launch of 5G in 2020, the amount of data that moves on the internet is increasing as high-volume video and game data is added to existing documents, images, and sound data.

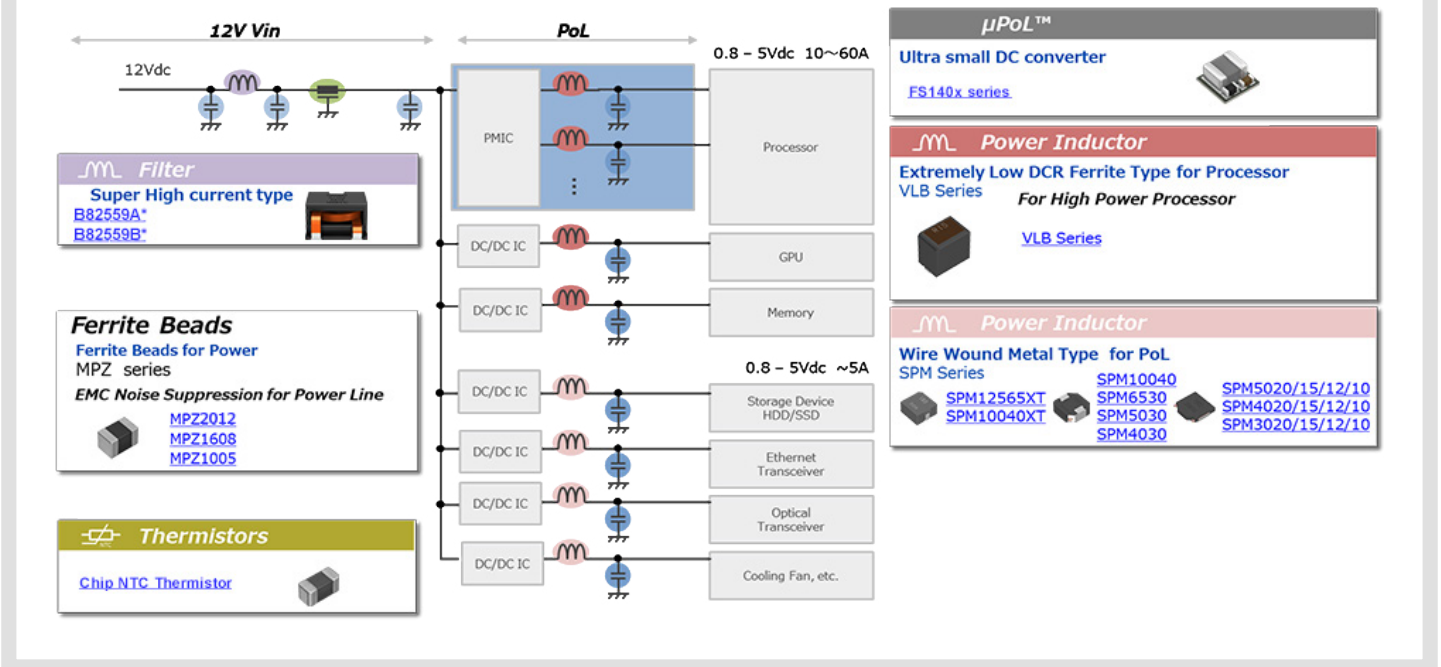
In addition, technologies are evolving, exemplified by AI, and a digital transformation (DX) is taking place as a result of the use of big data and the internet of things (IoT). To support these advances, however, large numbers of high-performance servers that can process large volumes of data will be needed. In conjunction with the increased performance of processors and various types of ICs, higher clock speeds of power supply ICs on server boards, high current power saving, miniaturization, noise countermeasures in data lines, and surge countermeasures have become urgent issues. Here, we introduce TDK products for addressing and solving these problems including the VLBU series of ferrite power inductors compatible with the high-efficiency needs of VR13 and VR14 applications, the FS series of DC-DC converters with embedded μPOL™, solutions using the ALT series of pulse transformers and ALC series of common mode filters and chokes, and chip varistors and ceramic transient voltage suppressors used for surge protection.

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Power Supply Circuit Blocks and TDK's Product Lineup

Figure 1. Power Supply Circuit Blocks and TDK's Product Lineup



Voltage Regulator Modules (VRM) for Driving Processors

The CPU board power supply converts AC voltage to DC voltage using a front-end power supply unit and supplies DC 12V, 5V, and 3.3V to the motherboard. Current CPU operating voltages are 1.5V and lower, and the voltage supplied by the front-end unit is not suitable. Consequently, a voltage regulator module (VRM) is used to convert the DC 12V power to the voltage used by the CPU. CPU power supply voltage has been decreasing year by year in order to achieve low power consumption and high operating speeds (Figure 2 (a)), and as the voltage decreases, the allowable voltage fluctuation value becomes smaller (with a 5% tolerance in output voltage, at 1V the tolerance is 50 mV, but at 0.8V the tolerance is 40 mV), and a VRM is necessary to support fast transient response. If the current exceeds 50A, it is difficult to achieve this with a single DC-DC converter, and a multiphase circuit (Figures 2 (b) and 2 (c)) are used with a high-current VRM.

The conditions for the power inductor used in such a circuit are low inductance, high current, space saving, and low loss, and the VLBU series (Table 1) is suitable.

The VLBU series satisfy the high-efficiency conditions needed for VR13 and VR14 applications.

Figure 2. Core Voltage and Multiphase Circuit

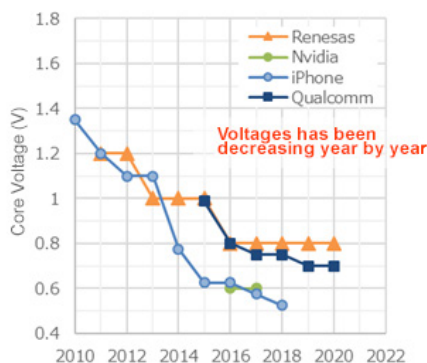


Figure 2 (a). Changes in Core Voltage

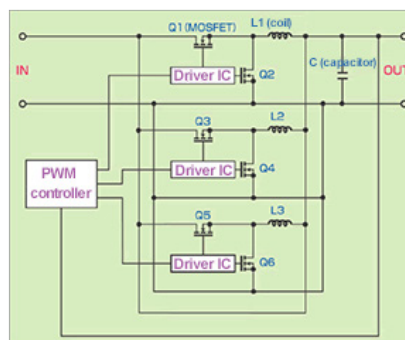


Figure 2 (b). A Multiphase Circuit

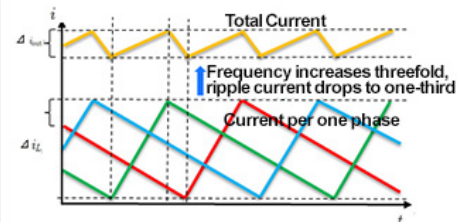



Figure 2 (c). Current Waveforms of Multiphase Circuits

Table 1. The VLBU Series of Ferrite Power Inductors Compatible with the High-Efficiency Conditions needed for VR13 and VR14 Applications and their Features


		Low loss	High current	Narrow shape	High reliability
Server Intel Platform		VR13	VR13HC	VR13HC & VR14	VR14
TDK P#		VLBU1007090	VLBU9664100	VLBU10060120	VLBU1024660
Dimension (LxWxT)		10.0x7.0x9.0	9.6x6.4x10.0	10.0x6.0x12.0	10.2x4.6x6.0
Inductance		100-400nH	70-150nH	70-150nH	70-150nH
RDC		0.18mohm	0.125mohm	0.12mOhm	0.23mOhm
Isat		30-136 A	76-150 A	82-160 A	45-93A
Itemp.		70 A	75 A	83 A	70
M.P. Capability	Engineering Sample	Available	Available	Available	Available
	Status	M.P.	M.P.	M.P.	M.P.



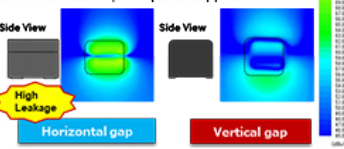
Operating Temperature Range
-40°C~125°C
(including self-temperature rise)

Applications
Server · BTS · VR

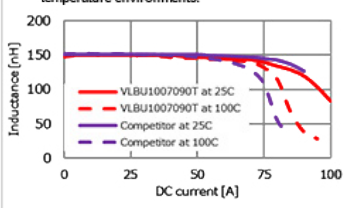
High-density mounting
Offers a narrow configuration and high-density mounting distance between coils



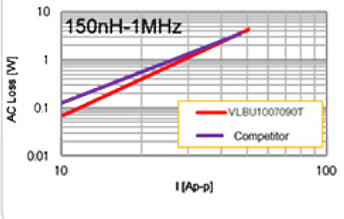
Smaller distances between products
Achieves low leakage magnetic flux in the product width direction by providing the core gap in the vertical direction. Interference between inductors can be suppressed so the distance between inductors can be reduced in multiphase power supplies.



Excellent direct current superimposition characteristics
The core is made of a material that is not easily magnetically saturated with current, even in high temperature environments.



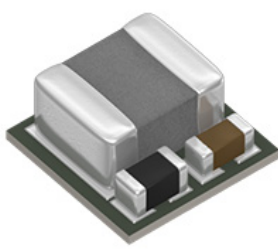
Low loss
A low-loss core material is used.



In addition, TDK provides support for simple layout design using the ultra-compact POL with embedded ICs. The output voltage and various settings can be programmed at the time of IC shipment according to the use conditions. Please inquire for details.

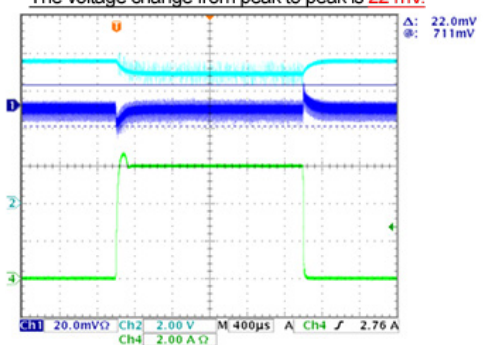
Figure 3. FS Series of DC-DC Converters with Embedded μ POL™ and its Features

The ultra-compact POL with embedded inductor facilitates layout design. The output voltage and various settings are programmed at the time of IC shipment according to the use conditions.




μ POL "FS1404/6"
3.3x3.3x1.5(mm)
IC (MOSFET Embedded Step-Down DC-DC)
+
Inductor
+
Capacitor × 2 units

Ultra-High-Speed Load Response
Example of load response characteristics from 0A to 6A
The voltage change from peak to peak is **22 mV**.

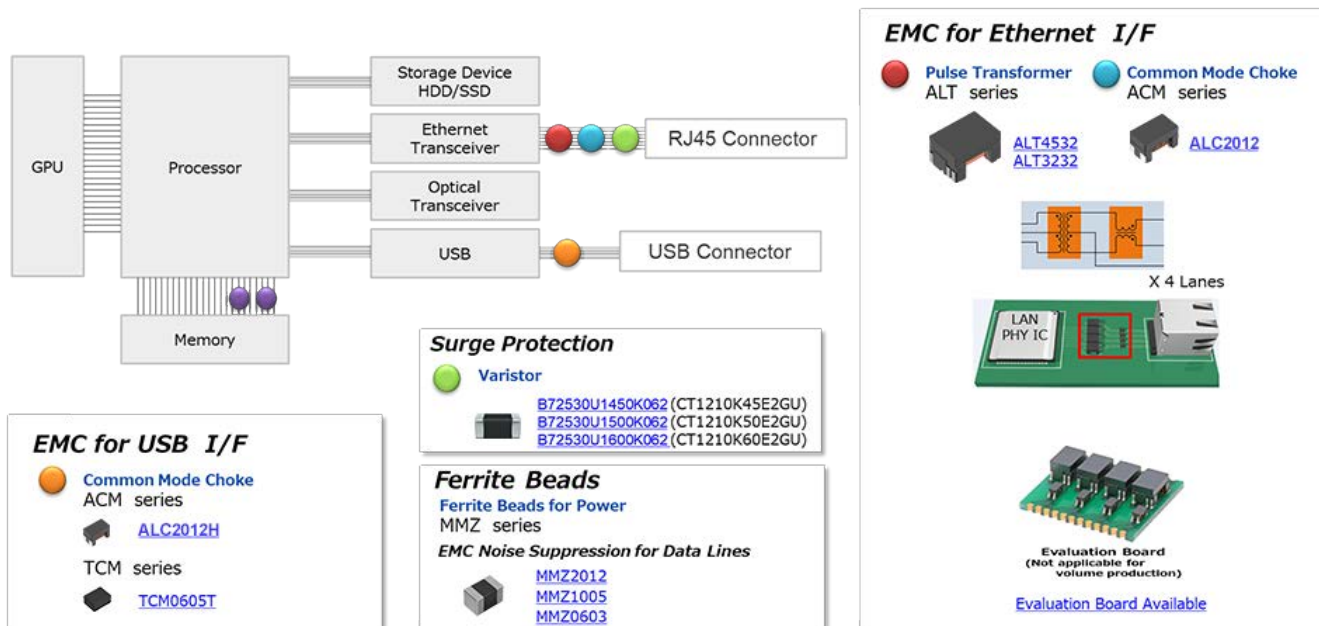


Input voltage: 4.5V-16V (when 5V external supply is possible, supports up to 2.5V input)
Output voltage: 0.6V-5V ±1% (No external resistor needed! The desired value is set at the time of shipment from the plant in 5 mV steps.)
Output current: 4A/6A
Equipped with enable/power good output pin, max. switching frequency of 4 MHz enabled, Soft Start, UVP, OVP, OCP, OTP and other protection functions



Product Portal
 μ POL™ Embedded DC-DC Converters

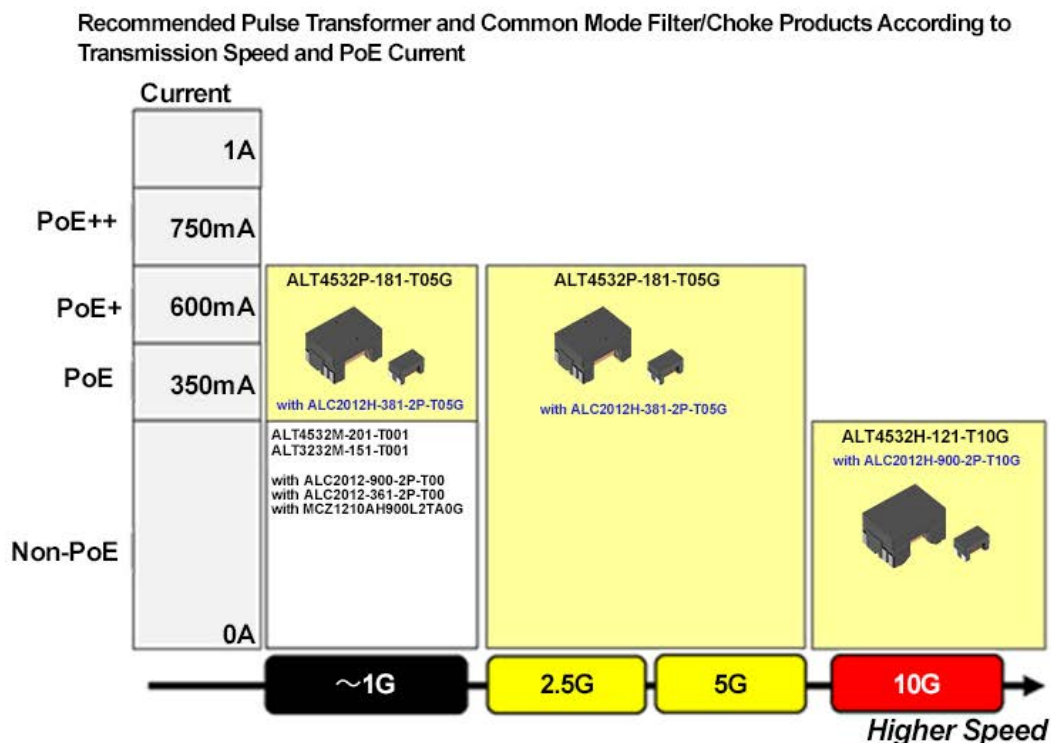
Figure 4. Data Line Circuit Blocks and TDK's Product Lineup



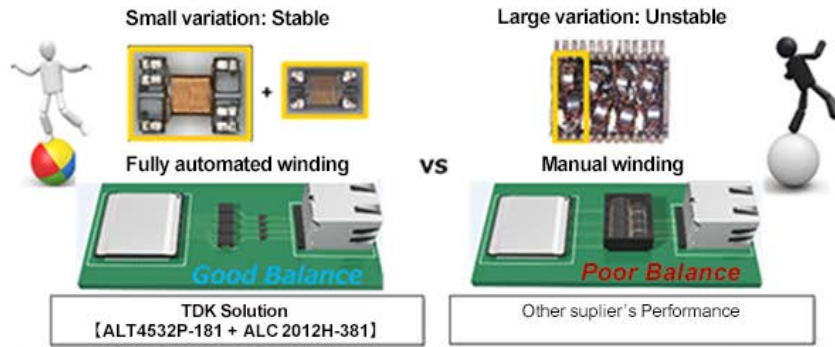
Wired LANs are used with cable connections, and Ethernet is currently used as the standard.

Data volumes are growing year by year, and transmission speeds are increasing to 100MbE, 1GbE, and 10GbE. There is also a trend toward mounting multiple pulse transformers on a single board, and there is a need for small sizes. In the current pulse transformer market, toroidal configuration products account for the majority of products, but TDK uses original structural designs to create SMD type products that are compatible with automated mounting. In addition, an automated winding process is used in production, contributing to stable quality.

Figure 5. Solutions Using the ALT Series of Pulse Transformers & ACM Series of Common Mode Filters/Chokes



Automated Winding Process Stabilizes Quality



	Data Rate	Spara metaer Comparison						Note
		Sdd11	Sdd22	Sdd12	Sdd21	Sdd12	Sdd22	
ALT4532P-181 + ALC2012H-381	2.5G	○	○	○	○	⊙	⊙	TDK Recommendation
Other supplier (Toroid Core Item)		○	○	○	○	×	△	
ALT4532P-181 + ALC2012H-381	5G	○	○	○	○	⊙	⊙	TDK Recommendation
Other supplier (Toroid Core Item)		○	○	△	△	×	×	



Application Note

Recommended combinations of products in the ALT series and common mode filters/chokes

Since a wired LAN uses a cable, an ESD failure may occur when connecting or disconnecting the connector, or a surge voltage may be applied to the data line due to a power surge, lightning strike, etc., and the IC may be damaged. As a countermeasure, a protective element is placed for each input / output pin to reduce surge. The chip varistor is smaller than other protective elements and has excellent surge suppression characteristics.

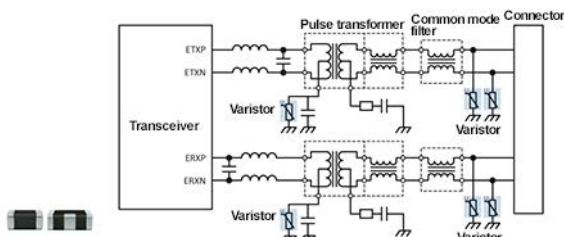
Figure 6. Surge Protection Devices: Chip Varistors and Ceramic Transient Voltage Suppressors

Advantage : CTVS – U-Series

- Satisfies the immunity characteristics in indoor and outdoor environments.
- Excellent surge suppression effect is achieved even in a small package.
- +125 °C can be used without hesitation
- UL 1449 standard authorization

Lineup of Products Compatible with Indoor and Outdoor Environments

	Indoor	Indoor (high withstanding)	Outdoor
Set	VoIP Phones Wireless Access Point Networked Audio	Door Access Systems Video Phones, IP cameras, Point-of-Sale Systems	Base station
Required surge value	500 A (10 x 8/20 μs) 100 A (10 x 5/320 μs)	1000 A (10 x 8/20 μs) 6 kV 10/700 μs (equal 150 A)*	3000 A... 5000 A (10 x 8/20 μs)
Recommended product	CT1210K17E2G (E72530T8170K062) CT1210K25E2G (E72530T6250K062) CT1210K45E2G (E72530U1450K062) CT1210K50E2G (E72530U1600K062)	CT1210K45E2G (E72530U1450K062) CT1210K50E2G (E72530T6500K062) CT1210K60E2G (E72530U1600K062)	CT2220S50E3G (E72540T6500S162) CN2220K60E2GK2 (E72542V6600K062)



Contact Information

Inquiries on products, sales, or technical matters

Related Links

Selection Guide



Selection Guide

Inductors for Power Circuits (Commercial Grade)



Selection Guide

Integrated version : Signal Line Common Mode Filters/
Chokes, ESD Protection Devices(Commercial Grade)



Selection Guide

Signal Line Common Mode Filters/Chokes (Commercial
Grade)



Selection Guide

ESD Protection Devices (Commercial Grade)



Selection Guide

Chip NTC Thermistors

Applications & Cases



Application Note

Recommended combinations of products in the ALT
series and common mode filters/chokes