3W AC-DC power supply
Integrated isolated RS-485

RoHS

3 years Warranty

FEATURES

- Universal 85 - 305V AC and wide 100 - 430V DC input voltage range
- Accepts AC and/or DC input (dual-use of same terminal)
- I/O isolation test voltage of 4000VAC
- Output short circuit and overcurrent protection
- High baud rate up to 500kbps
- Bus supports up to 128 nodes maximum
- Compact open frame design with high power density
- Flexible design of peripheral circuit reduces layout issues

TLAxx-03K485 series are 3W AC-DC power converters with integrated, isolated RS-485. The products can directly be connected to commercial 220V AC power sources. The main DC power output of the supply is 2.5W and the auxiliary DC power output is used for bus communication. They feature a very high isolation test voltage of 4000VAC between AC input and each of the two DC power outputs, and 1500VDC in between the two DC power outputs. The products are widely used in industrial and electrical instrumentation and similar demanding applications for Digital communications networks requiring wide input voltage ranges, a completely isolated bus and compliance to UL/CE safety and EMC standards. For applications in extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.	Output Power	Rated Output Voltage Vo (V)	Rated Output Current Io (mA)	Efficiency at 230VAC (%) Typ.	Baud Rate (kbps)	Number of Nodes
CE	TLA03-03K485	3W	3.3V(1.65W)/5V(0.125W)	500/25	55	500	128
	TLA05-03K485		5V(2.5W)/5V(0.125W)	500/25	68		
--	TLA12-03K485		12V(2.4W)/5V(0.125W)	200/25	70		

Power Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.15	A
	230VAC	--	--	0.07	
Input Surge Voltage	115VAC	--	--	13	
	230VAC	--	--	23	
Required External Input Fuse		1.0A rated slow-blow fuse, required			
Hot Plug		Unavailable			

Power Output Specifications

Item	Operating Conditions			Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Balanced load	Primary output Vo1	TLA03-03K485	3.0	3.3	3.6	VDC
			TLA05-03K485	4.75	5	5.25	
			TLA12-03K485	11.4	12	12.6	
		Secondary output Vo2		--	5	--	
Line Regulation	Balanced load	Primary output Vo1			--	±1.5	%
		Secondary output Vo2		--	--	±2	
Load Regulation	Double isolated output (Primary output)			--	--	±5	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	Primary output Vo1		--	--	200	mVpp
		Secondary output Vo2		--	--	300	
Temperature Coefficient				--	--	±0.15	%/℃
Short Circuit Protection				Continuous, self-recovery			

Overcurrent Protection			120 - 300% Io, self-recovery			
Minimum Load	Double isolated output (Primary output)		10%Io	--	--	mA
	Double isolated output (Secondary output)		10	--	--	
Capacitive Load (μF) Max.	Primary output / Secondary output	TLA03/05-03K485	1500 / 22			μF
		TLA12-03K485	470 / 22			
Note: * The "parallel cable" method is used for Ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.						

Signal Input Specifications(TLA03-03K485: VDD=3.3V)

Item		Symbol	Min.	Typ.	Max.	Unit
TXD Logic Level	High-level	V_{IH}	0.7 * VDD	--	VDD	VDC
	Low-level	V_{IL}	0	--	0.8	
RXD Logic Level	High-level	V_{OH}	VDD - 0.4	VDD - 0.2	--	
	Low-level	V_{OL}	0	0.2	0.4	
TXD Drive Current		I_T	2	--	--	mA
RXD Output Current		I_R	--	--	4	
CON Drive Current		I_{CON}	--	--	5	
Serial Interface		Compatible with + 3.3 V UART interface only				

Signal Input Specifications(TLA05-03K485: VDD=5.0V)

Item		Symbol	Min.	Typ.	Max.	Unit
TXD Logic Level	High-level	V_{IH}	0.7 * VDD	--	VDD	VDC
	Low-level	V_{IL}	0	--	0.8	
RXD Logic Level	High-level	V_{OH}	VDD - 0.4	VDD - 0.2	--	
	Low-level	V_{OL}	0	0.2	0.4	
TXD Drive Current		I_T	2	--	--	mA
RXD Output Current		I_R	--	--	4	
CON Drive Current		I_{CON}	--	--	5	
Serial Interface		Compatible with both +3.3V and +5.0V UART interface only				

Signal Input Specifications(TLA12-03K485: VDD=3.3V/5.0V)

Item		Symbol	Min.	Typ.	Max.	Unit
TXD Logic Level	High-level	V_{IH}	0.7 * VDD	--	VDD	VDC
	Low-level	V_{IL}	0	--	0.8	
RXD Logic Level	High-level	V_{OH}	VDD - 0.5	VDD - 0.3	--	
	Low-level	V_{OL}	0	0.2	0.4	
TXD Drive Current		I_T	2	--	--	mA
RXD Output Current		I_R	--	--	4	
CON Drive Current		I_{CON}	--	--	5	
Serial Interface		Compatible with both +3.3V and +5.0V UART interface only				

Signal Output Specifications

Item	Symbol	Min.	Typ.	Max.	Unit
Differential Level	$V_{diff(d)}$, R_L=54Ω	1.5	2	+Vo2	VDC
Bus Pin Maximum Voltage		-7	--	12	VDC
Differential Load Resistance		54	--	--	Ω
Differential Input Impedance	-7V≤V_{CM}≤+12V	96	--	--	kΩ
Bus Interface Protection		ESD protection			

Signal Transmission Specifications

Item		Symbol	Min.	Typ.	Max.	Unit
Data Delay	TXD Transmitter Delay	t_T	--	55	110	ns
	RXD Receiver Delay	t_R	--	65	110	

	Handoff Delay		--	--	18	us

Truth Table Specifications

Transceiver Control	Input		Output		
Send status	CON	TXD	A	B	RXD
	0	1	1	0	1
	0	0	0	1	1
Receive status①	CON	V_A-V_B	RXD		
	1	≥-10mV	1		
	1	≤-200mV	0		
	1	-200mV<V_A-V_B<-10mV	Undefined state		

Note: ①Receiving threshold varies with Vcc will produce subtle error.

General Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Isolation test	Input-output	Electric Strength Test for 1min., leakage current <5mA	AC-DC	4000	--	--	VAC
			DC-DC	1500	--	--	VDC
Operating Temperature				-40	--	+85	℃
Storage Temperature				-40	--	+105	
Storage Humidity				--	--	85	%RH
Power Derating		Temperature derating	-40℃ to -20℃ (See Product Characteristic Curve)	3.0	--	--	%/℃
			70℃ to 85℃ (See Product Characteristic Curve)	1.67	--	--	
		Input Voltage derating	85VAC-100VAC	1.2	--	--	%/VAC
			277AVC-305VAC	1.1	--	--	
Soldering Temperature		Wave-soldering		260 (± 5)℃; time：5 - 10s			
		Manual-soldering		360 (± 10)℃; time：3 - 5s			
MTBF		MIL-HDBk-217F@25℃		>300,000 h			

Mechanical Specifications

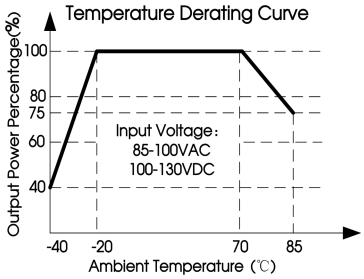
Dimensions	44.2 x 19.7 x 13.0 mm
Weight	8g (Typ.)
Cooling Method	Free air convection

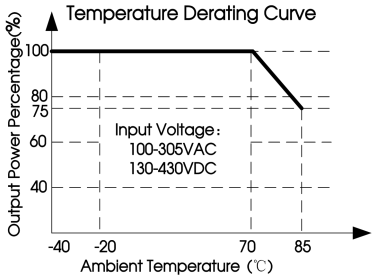
Electromagnetic Compatibility (EMC)

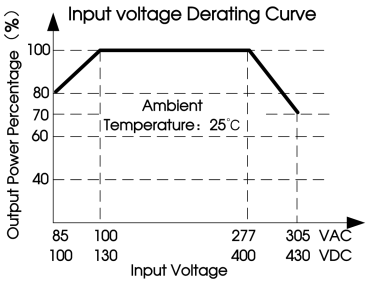
Emissions	CE	CISPR32/EN55032	CLASS A (see Fig.1)	
		CISPR32/EN55032	CLASS B (see Fig.2)	
	RE	CISPR32/EN55032	CLASS A (see Fig.1)	
		CISPR32/EN55032	CLASS B (see Fig.2)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4kV (Power output port and bus port)	Perf. Criteria B
	EFT	IEC/EN61000-4-4	±2kV (see Fig.1)	perf. Criteria B
		IEC/EN61000-4-4	±4kV (L、N) (see Fig.2)	perf. Criteria B
	Surge	IEC/EN61000-4-5	±1kV (L、N) (see Fig.1)	perf. Criteria B
		IEC/EN61000-4-5	±2kV (A、B) (see Fig.3)	perf. Criteria B

Product Characteristic Curve

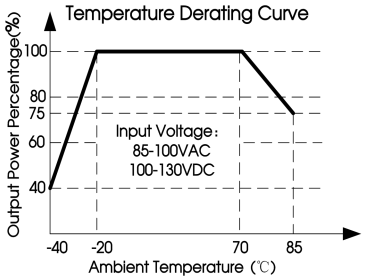
1. TLA03-03K485/TLA05-03K485 product characteristic curve

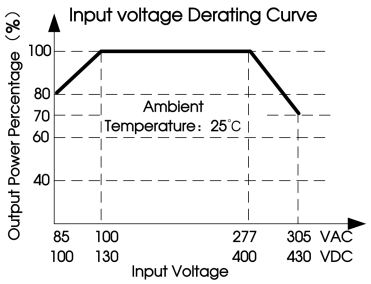






2. TLA12-03K485 product characteristic curve





Note: ① With an AC input between 85 - 100VAC/277- 305VAC and a DC input between 100 - 130VDC/400 - 430VDC the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.

Design Reference

1. Typical application

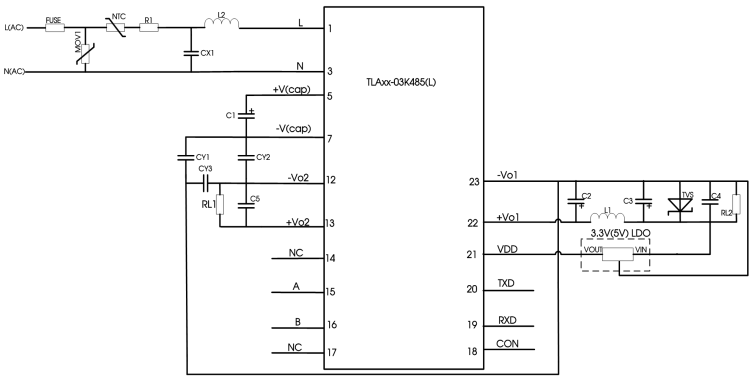


Fig.1

Component	Recommended part, value	
	TLA03/05-03K485	TLA12-03K485
FUSE (required)	1A/300V	
R1	12Ω/2W	
MOV1	14D561	
C1 (required)	22uF/450V (-40℃ to 85℃)	15uF/450V (-40~85℃)
L2	4.7mH	
NTC	13D-5	
C2 (required)	270uF/16V (Solid Capacitor)	
L1 (required)	4.7uH	
C3 (required)	120uF/25V	
C4	0.1uF	
CY1/ CY2 (required)	2200pF	
TVS	SMBJ7.0A	
CY3 (required)	560pF	
CX1	0.047uF/480V	
C5 (required)	100uF/16V	
LDO(TLA12-03K485 required)	MORNSUN P/N:K78(L)03-500R3(3.3V) K78(L)05-500R3(5V)	

2. EMC solution-recommended circuit

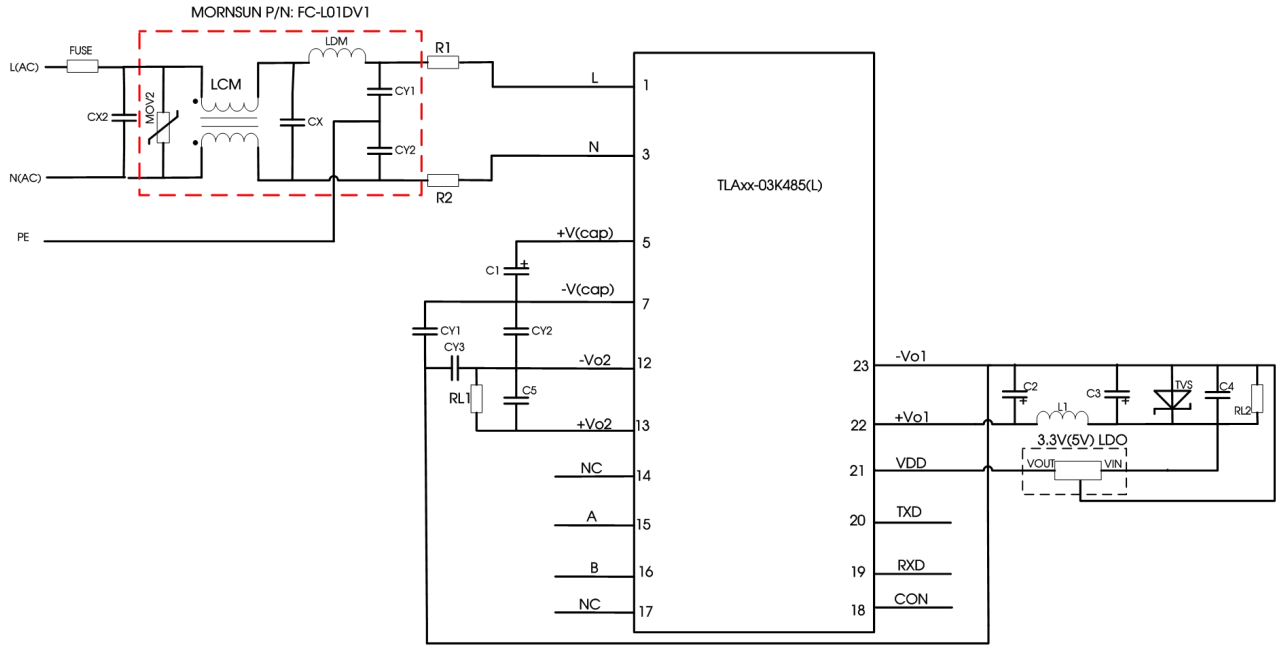


Fig.2

Note: We recommend using our EMC filter part no. FC-L01DV1 (indicated by dashed line);
Use 0.15uF/480V for CX2;
Use 12Ω/2W current limiting resistors for R1, R2. Refer to typical application for all other component values.

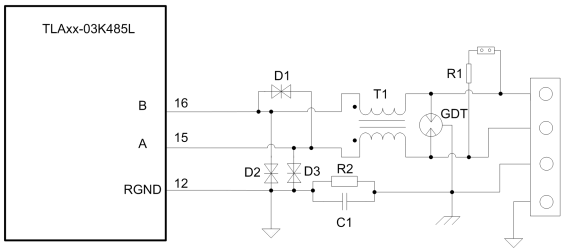


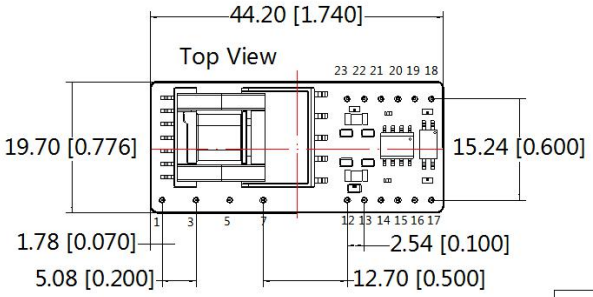
Fig.3

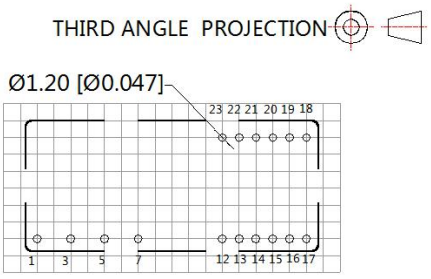
Component	Recommended part, value	Component	Recommended part, value
R1	120Ω	R2	1MΩ
C1	1nF, 2kV	D1	SMBJ12CA
T1	ACM2520-301-2P	D2, D3	SMBJ6.5CA
GDT	S30-A90X		

As the modules internal A / B lines come with its own ESD protection, which generally satisfy most application environments without the need for additional ESD protection devices, as shown in the typical circuit in Figure 1. For harsh and noisy application environments such as motors, high voltage/current switches, lightning and similar however, we recommended that the user protects the module's A / B lines with additional measures and external components such as TVS tube, common mode inductors, Gas discharge tube, shielded twisted pair of wires with the same single network Earth point. Figure 3 shows our recommended circuit diagram for such type of applications with components and values given in the table above. This recommendation is for reference only and may have to be adapted accordingly with appropriate component values in order to match the actual situation and application.

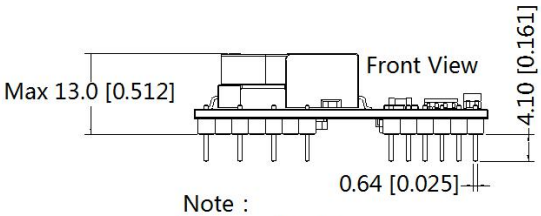
3. For additional information about Mornsun and its products, please refer to www.mornsun-power.com where you can also download application notes and the EMC Filter Selection Guide.

Dimensions and Recommended Layout





Note：Grid: 2.54*2.54mm



Note：
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±1.0[±0.040]
The layout of the device is for reference only , please refer to the actual product

Pin-Out					
Pin	Function	Function Definitino	Pin	Function	Function Definitino
1	AC(L)	AC Input(L)	16	B	485 Bus B Pin
3	AC(N)	AC Input(N)	17	NC	Not Connected
5	+V(cap)	Filter Capacitor+	18	CON	Send&Receiving Control Pin
7	-V(cap)	Filter Capacitor-	19	RXD	Receiving Pin
12	-Vo2	Secondary output-	20	TXD	Sending Pin
13	+Vo2	Secondary output+	21	VDD	Singal Port I/O Supply Input Pin
14	NC	Not Connected	22	+Vo1	Primary Output+
15	A	485 Bus A Pin	23	-Vo1	Primary Output-

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number: 58220026;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage (115V and 230V) and rated output load;
3. This model is open plate, in order to meet the safety requirements of the module primary and secondary external components between the need to maintain a safe distance of at least 6.4mm;
4. In order to improve the efficiency of conversion at light load, the module may have audio noise, but does not affect product performance and reliability;
5. After the module is assembled, it needs to be fixed;
6. All index testing methods in this datasheet are based on company corporate standards;
7. The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
8. We can provide product customization service;
9. Products are related to laws and regulations: see "Features" and "EMC";
10. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

MORNSUN Guangzhou Science & Technology Co., Ltd.
Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Luogang District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: sales@mornsun.cn