

3W AC-DC power supply  
Integrated isolated CAN bus



CE Report

RoHS

EN62368-1

## 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 over current protection
- High baud rate up to 1Mbps
- Bus supports up to 110 nodes maximum
- Compact open frame design with high power density
- Flexible design of peripheral circuit reduces layout issues

TLAxx-03KCAN series are 3W AC-DC power converters with integrated CAN bus. The products can directly be connected to 220V AC mains 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 controller area 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	Rated Output Current Io (mA)	Efficiency at 230VAC(%) Typ.	Baud Rate (kbps)	Number of Nodes
EN	TLA03-03KCAN	3W	3.3V(1.65W)/5V(0.125W)	500/25	55	5-1000	110
	TLA05-03KCAN		5V(2.5W)/5V(0.125W)	500/25	68		
	TLA12-03KCAN		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
	277VAC	--	--	0.07	
Input Surge Voltage	115VAC	--	--	13	
	277VAC	--	--	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	TLA03-03KCAN	3.0	3.3	3.6	VDC
			TLA05-03KCAN	4.75	5	5.25	
			TLA12-03KCAN	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)	Primary output Vo1	--	--	200	mVpp	
		Secondary output Vo2	--	--	300		
Temperature Coefficient		--	--	±0.15	%/°C		
Short Circuit Protection		Continuous, self-recovery					
Overcurrent Protection		120 - 300% Io, self-recovery					

Minimum Load	Double isolated output		10%Io	--	--	mA
	Double isolated output (Secondary output)		10	--	--	
Capacitive Load (μF) Max.	Primary output /	TLA03/05-03KCAN			1500 / 22	μF
	Secondary output	TLA12-03KCAN			470 / 22	

Note 1: \* The "parallel cable" method is used for Ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.  
Note 2: \* The maximum capacity load does not include the specifications recommended in the design reference.

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

Item	Symbol	Min.	Typ.	Max.	Unit	
TXD Logic Level	High-level	$V_{IH}$	0.7VDD	--	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		
Serial Interface	Standard CAN controller interface for +3.3V					

### Signal Input Specifications (TLA05-03KCAN: VDD=5.0V/3.3V)

Item	Symbol	Min.	Typ.	Max.	Unit	
TXD Logic Level	High-level	$V_{IH}$	0.7VDD	--	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		
Serial Interface	Standard CAN controller interface for both +3.3V and +5.0V.					

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

Item	Symbol	Min.	Typ.	Max.	Unit	
TXD Logic Level	High-level	$V_{IH}$	0.7VDD	--	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		
Serial Interface	Standard CAN controller interface for both +3.3V and +5.0V.					

### Signal Output Specifications

Item	Symbol	Min.	Typ.	Max.	Unit	
Dominant Level (Logic 0)	CANH	$V_{(OD)CANH}$	2.75	3.5	4.5	VDC
	CANL	$V_{(OD)CANL}$	0.5	1.5	2.25	
Recessive Level (Logic 1)	CANH	$V_{(OR)CANH}$	2	2.5	3	
	CANL	$V_{(OR)CANL}$	2	2.5	3	
Differential Level	Dominant Level (Logic 0)	$V_{diff(d)}$	1.5	2	3	
	Recessive Level (Logic 1)	$V_{diff(r)}$	-0.12	0	0.05	
Bus Pin Maximum Withstand Voltage	$V_x$	-36	--	+36	μA	
Bus Transient Voltage	$V_{tr}$ , meets ISO7637-3 standard	-150	--	+100		
Bus Pin Leakage Current	(VDD=0V, $V_{CANH/L}=5V$ )	-5	--	5	Ω	
Differential Load Resistance	$R_L$	45	60	65		
CAN Bus Interface	Meets ISO/DIS 11898 standard Twisted-pair output					

Signal Transmission Specifications

Item	Symbol	Min.	Typ.	Max.	Unit
Data Delay	TXD Transmitter Delay	tr	55	115	ns
	RXD Receiver Delay	tr	65	135	
	Cycle Delay	t <sub>PRO(TXD-RXD)</sub>	120	250	

General Specifications

Item	Symbol	Min.	Typ.	Max.	Unit	
Isolation Test	Input-output(Power Supply)	Electric strength test for 1min., leakage current <5mA	AC-DC	4000	--	VAC
	Output-output(Power Supply)		DC-DC	1500	--	VDC
Operating Temperature		-40	--	+85	°C	
Storage Temperature		-40	--	+105		
Storage Humidity		--	--	85	%RH	
Safety Standard		EN62368-1 (Report)				
Power Derating	Temperature derating	-40°C to -20°C (See Product Characteristic Curve)	3.0	--	--	% / °C
		+70°C to +85°C (See Product Characteristic Curve)	1.67	--	--	
	Input Voltage derating	85VAC-100VAC	1.2	--	--	% / VAC
	277AVC-305VAC	1.1	--	--		
MTBF	MIL-HDBk-217F@25°C	>300,000 h				

Mechanical Specifications

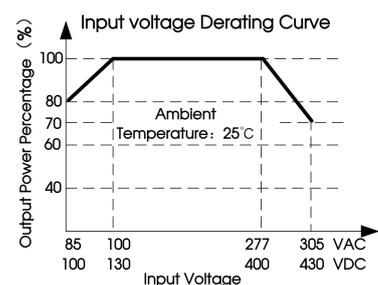
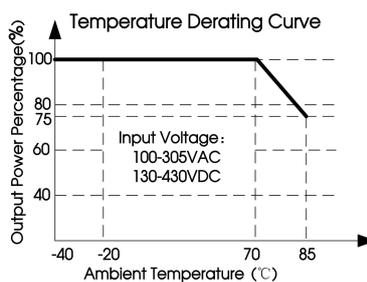
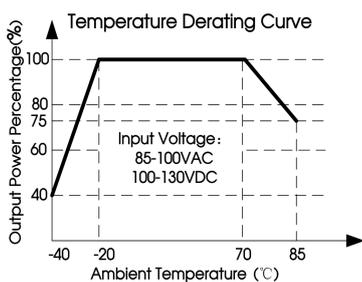
Dimensions	41.8 x 19.6 x 13.0 mm
Weight	8.0g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

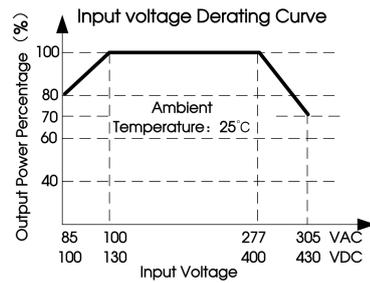
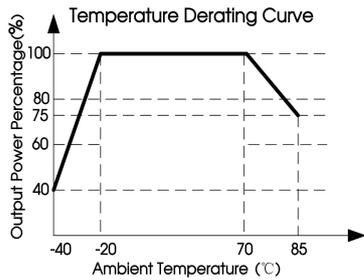
Emission	CE	CISPR32/EN55032	CLASS A (see Fig.1)	
		CISPR32/EN55032	CLASS B (see Fig.2)	
	RE	CISPR32/EN55032	CLASS A (see Fig.1)	
		CISPR32/EN55032	CLASS B (see Fig.2)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4kV (Power output port and bus port)	Perf. Criteria B
	EFT	IEC/EN61000-4-4	±2kV (see Fig.1)	perf. 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 (CANH, CANL, see Fig.3)	perf. Criteria B

Product Characteristic Curve

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



2. TLA12-03KCAN 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 circuit

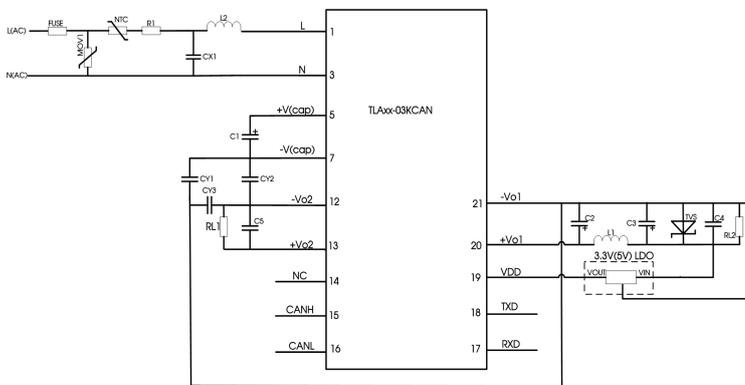


Fig.1

Component	Recommended part, value	
	TLA03/05-03KCAN	TLA12-03KCAN
FUSE (required)	1A/300V	
R1(winding resistors)	12 Ω /2W	
MOV1	14D561	
C1 (required)	22uF/450V -40°C to 85°C	15uF/450V -40°C to 85°C
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 (Safety Capacitor)	
TVS	SMBJ7.0A	SMBJ15A
CY3 (required)	560pF	
CX1	0.047uF/310VAC	
C5 (required)	100uF/16V	
LDO(TLA12-03KCAN required)	MORNSUN P/N: K78(L)03-500R3(3.3V) K78(L)05-500R3(5V)	
RL1/RL2	External load	

2. EMC compliance recommended circuit

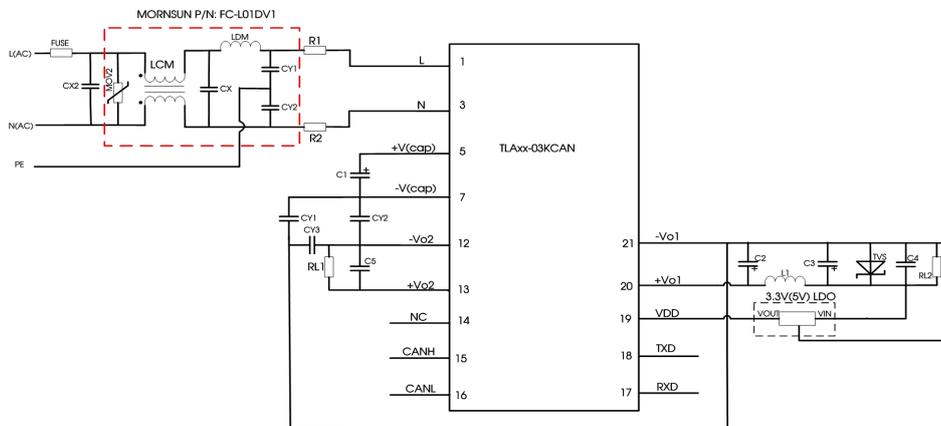


Fig.2

Note: We recommend using our EMC filter part no. FC-L01DV1 (indicated by dashed line);

Use 0.15uF/310VAC for CX2;

Use 12Ω /2W current limiting resistors(winding resistors) for R1, R2. Refer to typical application for all other component values.

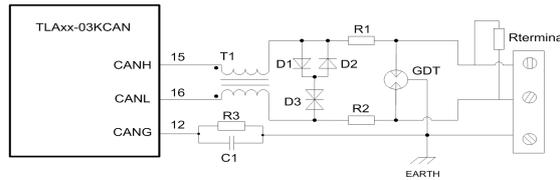


Fig.3

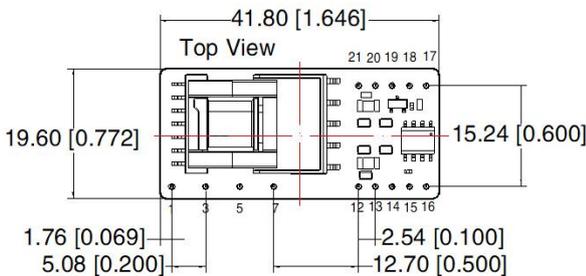
Component	Recommended part, value	Component	Recommended part, value
R3	1MΩ, 1206	R1, R2	2.7Ω /2W
C1	1nF, 2kV	D1, D2	1N4007
T1	ACM2520-301-2P	D3	SMBJ30CA
GDT	B3D090L	Rterminal	120Ω

When the module is used in applications with harsh environment, it can be susceptible to large energy like lightning strike, etc. in which case, it is essential to add an adequate protection circuit to the CAN signal ports to protect the system from failure and maintain a reliable bus communication. Figure 3 provides a recommended protection circuit design for high-energy lightning surges, with a degree of protection related to the selected protection device. Parameter description lists a set of recommended circuit parameters, which can be adjusted according to the actual application situation. Also, when using the shielded cable, the reliable single-point grounding of the shield must be achieved.

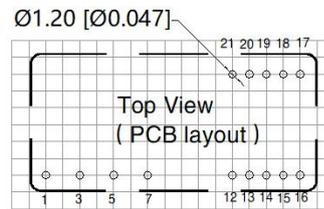
Note: The recommended components that will change the Specifications of Bus Pin Maximum Withstand Voltage by D3 and its values is a general guideline only. It must be verified for the actual user's application. We recommended using PTC's for R1 and R2 and to use fast recovery diodes for D1 and D2.

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

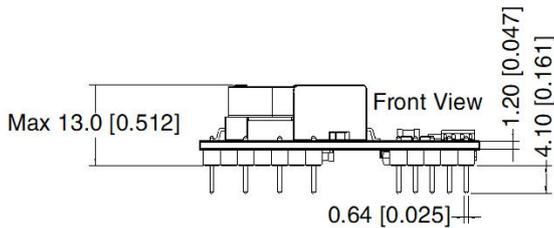
Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



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	Mark	Function	Pin	Mark	Function
1	AC(L)	AC Input(L)	15	CANH	CANH Pin
3	AC(N)	AC Input(N)	16	CANL	CANL Pin
5	+V(cap)	Filter Capacitor+	17	RXD	Receiving Pin
7	-V(cap)	Filter Capacitor-	18	TXD	Sending Pin
12	-Vo2	Secondary output-	19	VDD	Singal Port I/O Supply Input Pin
13	+Vo2	Secondary output+	20	+Vo1	Primary Output+
14	NC	Not Connected	21	-Vo1	Primary Output-

Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). The Packaging bag number: 58220026;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75%RH with nominal input voltage 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, please contact our technicians directly for specific information;
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.

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