

ESX.4cs-gw

ESX控制器



STW 微信号

主要特点

- 控制器专为极端恶劣工况的移动机械应用设计
- 编程支持C系列语言 或 IEC61131-3 (logi.CAD)
- 为移动机械不同网络之间的互联通信而设计
- 适用于安全型应用需求，符合标准
 - SIL2 IEC 61508:2010 或
 - PL d EN ISO 13849-1:2015

技术参数

- Aurix TC299 多核 32位处理器, 300 MHz
- 内部: 2 MB RAM, 8 MB Flash
- 外部: 16 MB Flash
- 32 kB EEPROM
- 6个CAN端口, 1个RS232端口, 最多可支持5个以太网端口和1个LIN端口
- 12路输入(支持SENT)
- 4路输出

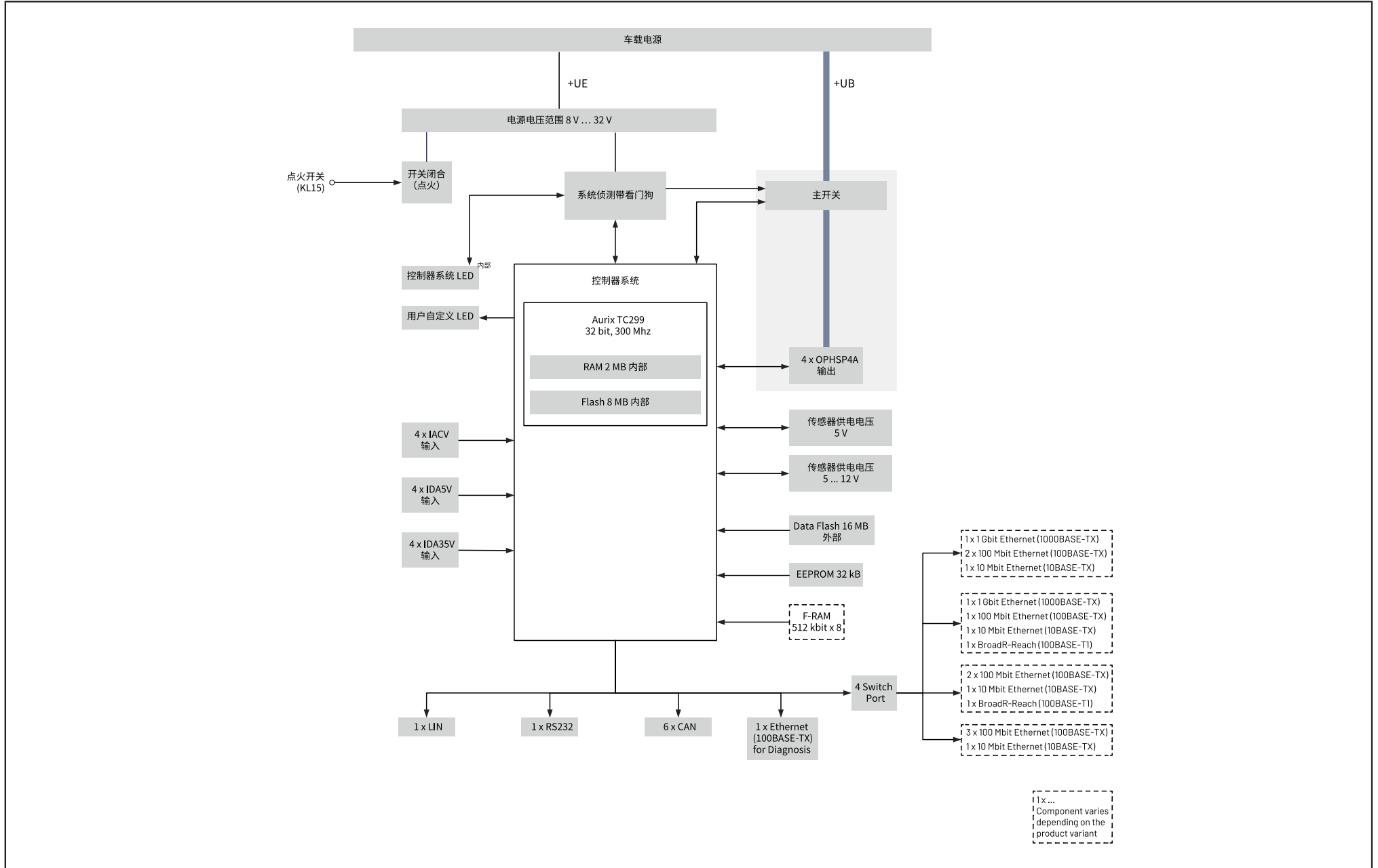
附件

- 控制器的调试变体
- 调试器
- 编译器
- 入门调试套装
- 开发组件和编程环境 C, logi.CAD IEC61131-3
- 连接插件
- 集成在STW系统开发软件 openSYDE

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内部结构示意图



变种

各种功能ESX.4cs-gw

变体	模拟量输入 IACV	复合功能型输入 IDA5V	复合功能型输入 IDA35V	数字/PWM 高边输出 OPHSP4A	可用的CAN接 口	RS232	最高100 Mbit Ethernet	1 Gbit Ethernet 通过M12连接	100 Mbit Ethernet 用于诊断	FRAM
变体1	4	4	4	4	6	1	4	-	1	1
变体2	4	4	4	4	6 CAN bus 1 (带唤醒功能) 带隔离 的CAN bus 4	1	3	1	1	-
变体3	4	4	4	4	6 (带隔离的 CAN bus 4)	1	3	1	1	-
变体4	4	4	4	4	6	1	4	-	1	-
变体5	4	4	4*	4	6	1	3	1	1	-

*) 自定义阈值

技术参数

处理器和存储

类型	描述	特点
Aurix TC299	32 bit, 多核处理器, 300 MHz	<ul style="list-style-type: none"> 带Window WatchDog的外部系统监控程序 用于模拟信号处理的12位A/D转换器
Flash	8 MB	7.75 MB 应用于客户应用程序
Data Flash	16 MB	External Data Flash
RAM	2 MB	片上 RAM 该内存主要用作BIOS堆栈和数据的系统内存，也包括用于客户应用程序的堆栈。
EEPROM (非易失性存储器)	32 kB	应用于客户应用程序 数据保留时效: <ul style="list-style-type: none"> 在125°C下50年 在25°C下100年 来自相关制造商的典型耐受测试: <ul style="list-style-type: none"> 25°C时400万次写入 85°C时120万次写入 125°C时60万次写入 145°C时40万次写入
FRAM	4 Mbit (512 kbit x 8 bit)	外部(可选, 在变体1中可用) 高耐久性100万亿次读写周期

技术参数

通信端口

类型	最大可用数量	配置
CAN	6	CAN 2.0 B, 高速和低速, 波特率从40 kbit/s到1 Mbit/s CAN 1: 唤醒功能 (选配) CAN总线4: 带隔离 (选配)
Ethernet	5	<ul style="list-style-type: none">• 1个100 Mbit/s以太网, 用于诊断监控• 1个4端口以太网交换机:<ul style="list-style-type: none">◦ 1个10 Mbit/s以太网◦ 2到3个100 Mbit/s 以太网 (可选配1个BroadRReach)◦ 提供选配选项: 1 个1 Gbit/s Ethernet 通过M12连接
RS232	1	波特率可高达 115 kbit/s

技术参数

输入

类型	最大可用数量	支持的配置	测量		
复合功能型输入 IDA35V	4	电压模拟量	0 ... 35 V		
		可编程上拉电阻	1.1 kΩ to +8.5 V		
		可编程下拉电阻	1 kΩ 对地		
		NAMUR 传感器	兼容NAMUR传感器		
		数字量	高位激活 (常开) 低位激活 (常开)		
		上升或下降沿	事件, 在信号的下降或上升沿作出反应		
		频率	0.6 Hz ... 20 kHz		
		增量型编码器接口	位置变化或角度变化		
		模拟量输入 IACV	4	电压模拟量	0 ... 12 V
				电流模拟量	0 ... 25 mA
数字量 (电压型)	高位激活 (常开)				
上升或下降沿	事件, 在信号的下降或上升沿作出反应				
复合功能型输入 IDA5V	4			电压模拟量	0 ... 5 V (适用于PT1000和KTY等)
		可编程上拉电阻	6.8 kΩ 到 +5 V		
		数字量	低位激活 (常闭)		
		上升或下降沿	事件, 在信号的下降或上升沿作出反应		
		频率	0.6 Hz ... 20 kHz		
		增量型编码器接口	位置变化或角度变化		
		SENT	SENT 接口		

技术参数

输出

类型	最大可用数量	支持的配置	范围	特征	特点
数字/PWM高边输出 OPHSP4A	4	PWM	0 ... 4 A	0 ... 100 % 占空比分辨率 < 0.1 % PWM频率 20..500 Hz	<ul style="list-style-type: none"> • 高边开关 • 精确地电流测量, 精度为 2 % • 支持电流控制模式 • 数字量反馈, OFF状态下空载检测 • 在过电流时自动关断 >7.5 A ±20 % • 将几个输出组合起来并行操作
		数字量	-	ON/OFF	
主开关	1	-	-	ON/OFF	<ul style="list-style-type: none"> • 切换输出组 • 高边开关 • 电流最高到12A
传感器电源电压 5 V	1	-	5 V	ON/OFF 电压输出精度为+2% 精确的电压读数为 ±2.5% ±50 mV	最大输出电流 250 mA
传感器电源电压 5 ... 12 V	1	电压	5 ... 12 V	电压输出精度为 ±2.5% ±50 mV 在下列条件下有效: • 电容性负载 ≤ 470 μF • 稳定时间 100 ms 电压精度回读: ±2.5% ±50 mV	最大输出电流 $I_{MAX} = 250 \text{ mA}$ 可编程输出需要降额输出电压 $U_{EXT} < 10 \text{ V}$: $I_{MAX} = 0.875 / (13.5 - U_{EXT}) \text{ A}$

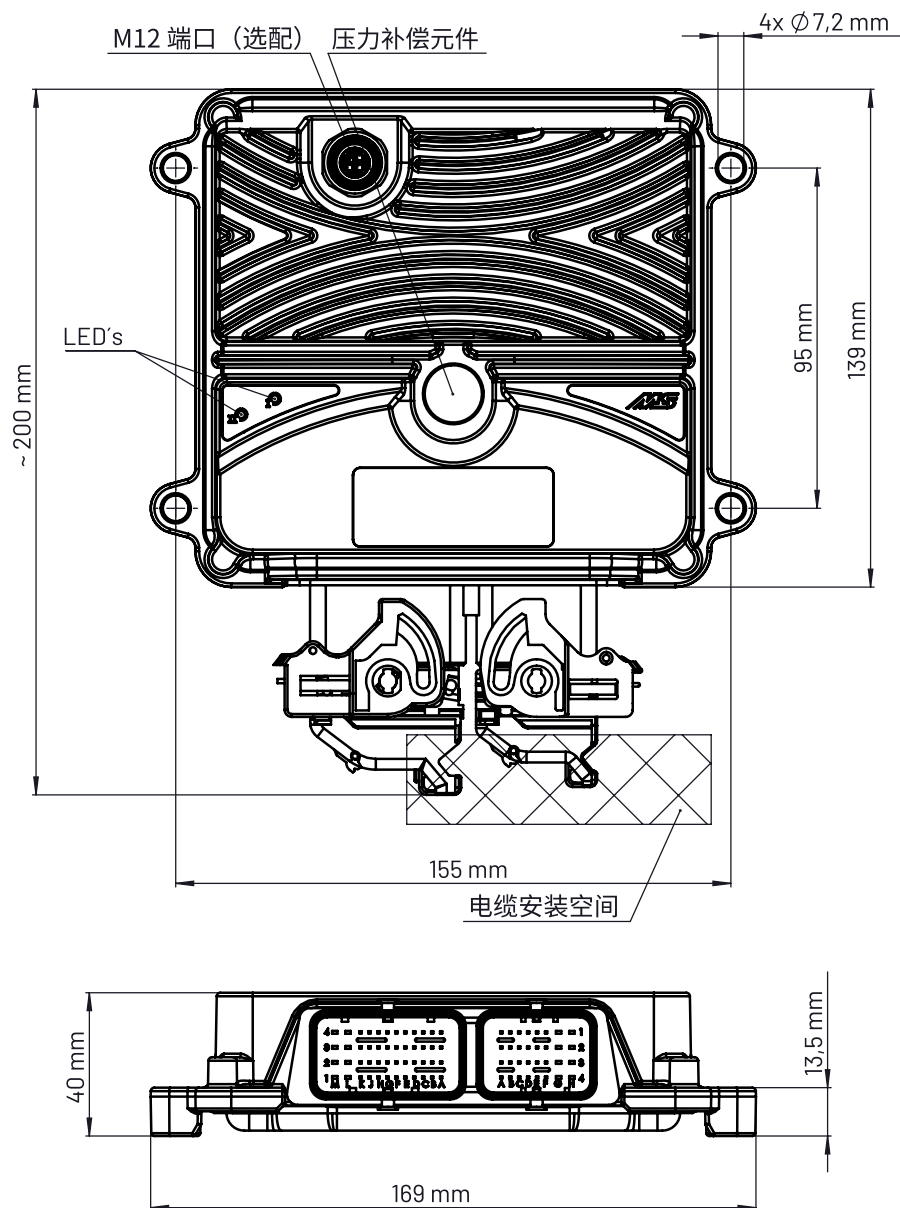
技术参数

机械参数

部件	描述	参数值
接口	-	Molex CMC 80 针, 可插拔次数最多 20次 当使用1 Gbit Ethernet 时: 8 针 M12 接口 x-coded, 可插拔次数最多 50次
指示灯	2 LED, 双色 (红色/绿色或混合色)	1个显示系统状态, 另一个可供用户自由编程使用
壳体	压铸铝合金	GORE-TEX™-用于平衡压力的呼吸过滤器
重量	-	约0.582 kg/约1.28lb
防护等级(带插头)	不带M12以太网接口的变体	IP6k7和IP6k9k
	变体带M12以太网接口	IP6k7
尺寸	-	169 mm x 163 mm x 40 mm
工作温度, 底部温度	-	-40 ... +85 °C (-40 ... +185 °F)
工作海拔	-	-400 ... +4000 米

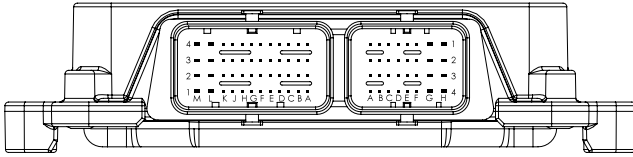
电源

部件	描述	范围	
		最小值	最大值
直流电源	+UE ECU电源和+UB电源电压	8 V DC	32 V DC
电流损耗	电源+UB短时满载		12 A
- 待机	+UE和+UB处输入电流之和 ($U_{KL15} = 0 \text{ V}$, ignition off) 没有外部负载		< 1 mA
- ECU 激活	+UE 电源电流 ($U_{KL15} > U_{KL15HIGH}$, 无外部负载)		< 在8V电源电压下400 mA < 在32V电源电压下100 mA



引脚分配 变体1, 4

引脚分配48针接口



引脚分配48针接口

Pin No	功能型号名称	描述
48.A1	CAN2_L	CAN bus 2 low
48.A2	CAN2_H	CAN bus 2 high
48.A3	CAN1_L	CAN bus 1 low
48.A4	CAN1_H	CAN bus 1 high
48.B1	LIN_Supply	RS232 TX / LIN (currently not available)
48.B2	LIN	RS232 RX / LIN (currently not available)
48.B3	ETH1_P1_BRR+	BroadR-Reach 100BASE-T1
48.B4	ETH1_P1_BRR_GND	BroadR-Reach 100BASE-T1
48.C1	ETH1_P3_Rx-	Ethernet 100BASE-TX
48.C2	CAN6_L	CAN bus 6 low
48.C3	ETH1_P1_BRR-	BroadR-Reach 100BASE-T1
48.C4	ETH1_P1_Tx+	Ethernet 100BASE-TX
48.D1	ETH1_P3_Rx+	Ethernet 100BASE-TX
48.D2	CAN6_H	CAN bus 6 high
48.D3	CAN4_GND	CAN bus 4 GND
48.D4	ETH1_P1_Tx-	Ethernet 100BASE-TX
48.E1	ETH1_P3_Tx-	Ethernet 100BASE-TX
48.E2	RS232_Tx	RS232 (TxD)
48.E3	CAN4_L	CAN bus 4 low
48.E4	ETH1_P1_Rx+	Ethernet 100BASE-TX

引脚分配 变体1, 4

引脚分配48针接口

Pin No	功能型号名称	描述
48.F1	ETH1_P3_Tx+	Ethernet 100BASE-TX
48.F2	RS232_Rx	RS232 (RxD)
48.F3	CAN4_H	CAN bus 4 high
48.F4	ETH1_P1_Rx-	Ethernet 100BASE-TX
48.G1	ETH1_P2_Rx-	Ethernet 10BASE-TX
48.G2	CAN5_L	CAN bus 5 low
48.G3	CAN3_L	CAN bus 3 low
48.G4	ETH2_Rx+	Ethernet 100BASE-TX 用于诊断
48.H1	ETH1_P2_Rx+	Ethernet 10BASE-TX
48.H2	CAN5_H	CAN bus 5 high
48.H3	CAN3_H	CAN bus 3 high
48.H4	ETH2_Rx-	Ethernet 100BASE-TX 用于诊断
48.J1	ETH1_P2_Tx-	Ethernet 10BASE-TX
48.J2	ETH1_P4_Rx-	Ethernet 100BASE-TX
48.J3	ETH1_P4_Tx+	Ethernet 100BASE-TX
48.J4	ETH2_Tx+	Ethernet 100BASE-TX 用于诊断
48.K1	ETH1_P2_Tx+	Ethernet 10BASE-TX
48.K2	ETH1_P4_Rx+	Ethernet 100BASE-TX
48.K3	ETH1_P4_Tx-	Ethernet 100BASE-TX
48.K4	ETH2_Tx-	Ethernet 100BASE-TX 用于诊断

引脚分配48针接口

Pin No	功能型号名称	描述
48.L1	-	未连接的
48.L2	-	未连接的
48.L3	-	未连接的
48.L4	-	未连接的
48.M1	GND	ECU接地
48.M2	+UB	电源输出
48.M3	+UE	ECU电源
48.M4	KL15	点火(KL15)

引脚分配 变体1, 4

引脚分布 32 针接口

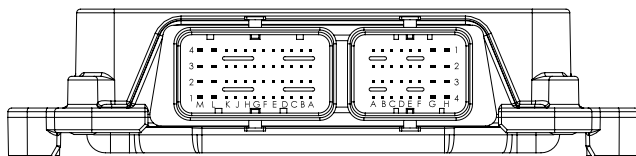
Pin No	功能型号名称	描述
32.A1	CAN1_H	CAN bus 1 high
32.A2	CAN1_L	CAN bus 1 low
32.A3	CAN2_H	CAN bus 2 high
32.A4	CAN2_L	CAN bus 2 low
32.B1	IACV_02	模拟量输入 IACV
32.B2	IDA35V_04	复合功能型输入 IDA35V
32.B3	IDA5V_01	复合功能型输入 IDA5V
32.B4	Uext_5V	传感器电源
32.C1	IDA5V_02	复合功能型输入 IDA5V
32.C2	IACV_01	模拟量输入 IACV
32.C3	Uext_5-12V	传感器电源
32.C4	AGND	模拟量接地
32.D1	IDA35V_03	复合功能型输入 IDA35V
32.D2	AGND	模拟量接地
32.D3	AGND	模拟量接地
32.D4	IACV_04	模拟量输入 IACV
32.E1	Uext_5-12V	传感器电源
32.E2	Uext_5V	传感器电源
32.E3	IACV_03	模拟量输入 IACV
32.E4	IDA5V_03	复合功能型输入 IDA5V

引脚分布 32 针接口

Pin No	功能型号名称	描述
32.F1	IDA35V_02	复合功能型输入 IDA35V
32.F2	IDA5V_04	复合功能型输入 IDA5V
32.F3	IDA35V_01	复合功能型输入 IDA35V
32.F4	KL15	点火(KL15)
32.G1	OPHSP4A_03	数字PWM高边输出 OPHSP4A
32.G2	OPHSP4A_04	数字PWM高边输出 OPHSP4A
32.G3	+UB	电源输出
32.G4	GND	ECU 接地
32.H1	OPHSP4A_01	数字PWM高边输出 OPHSP4A
32.H2	OPHSP4A_02	数字PWM高边输出 OPHSP4A
32.H3	+UB	电源输出
32.H4	+UE	电源 ECU

引脚分配 变体 2, 3, 5

引脚分布 48 针接口



引脚分布 48 针接口

Pin No	功能型号名称	描述
48.A1	CAN2_L	CAN bus 2 low
48.A2	CAN2_H	CAN bus 2 high
48.A3	CAN1_L	CAN bus 1 low
48.A4	CAN1_H	CAN bus 1 high
48.B1	LIN_Supply	LIN (currently not available)
48.B2	LIN	LIN (currently not available)
48.B3	ETH1_P1_BRR+	BroadR-Reach 100BASE-T1
48.B4	ETH1_P1_BRR_GND	BroadR-Reach 100BASE-T1
48.C1	ETH1_P3_Rx-	Ethernet 100BASE-TX
48.C2	CAN6_L	CAN bus 6 low
48.C3	ETH1_P1_BRR-	BroadR-Reach 100BASE-T1
48.C4	ETH1_P1_Tx+	Ethernet 100BASE-TX
48.D1	ETH1_P3_Rx+	Ethernet 100BASE-TX
48.D2	CAN6_H	CAN bus 6 high
48.D3	CAN4_GND	CAN bus 4 GND With variant 3 the pin is isolated
48.D4	ETH1_P1_Tx-	Ethernet 100BASE-TX
48.E1	ETH1_P3_Tx-	Ethernet 100BASE-TX
48.E2	RS232_Tx	RS232 (TxD)
48.E3	CAN4_L	CAN bus 4 low With variant 3 the pin is isolated

引脚分配 变体 2, 3, 5

引脚分布 48 针接口

Pin No	功能型号名称	描述
48.E4	ETH1_P1_Rx+	Ethernet 100BASE-TX
48.F1	ETH1_P3_Tx+	Ethernet 100BASE-TX
48.F2	RS232_Rx	RS232 (Rx/D)
48.F3	CAN4_H	CAN bus 4 high With variant 3 the pin is isolated
48.F4	ETH1_P1_Rx-	Ethernet 100BASE-TX
48.G1	ETH1_P2_Rx-	Ethernet 10BASE-TX
48.G2	CAN5_L	CAN bus 5 low
48.G3	CAN3_L	CAN bus 3 low
48.G4	ETH2_Rx+	Ethernet 100BASE-TX 用于诊断
48.H1	ETH1_P2_Rx+	Ethernet 10BASE-TX
48.H2	CAN5_H	CAN bus 5 high
48.H3	CAN3_H	CAN bus 3 high
48.H4	ETH2_Rx-	Ethernet 100BASE-TX 用于诊断
48.J1	ETH1_P2_Tx-	Ethernet 10BASE-TX
48.J2	-	未连接的
48.J3	-	未连接的
48.J4	ETH2_Tx+	Ethernet 100BASE-TX 用于诊断
48.K1	ETH1_P2_Tx+	Ethernet 10BASE-TX
48.K2	-	未连接的
48.K3	-	未连接的

引脚分布 48 针接口

Pin No	功能型号名称	描述
48.K4	ETH2_Tx-	Ethernet 100BASE-TX 用于诊断
48.L1	-	未连接的
48.L2	-	未连接的
48.L3	-	未连接的
48.L4	-	未连接的
48.M1	GND	ECU 接地
48.M2	+UB	电源输出
48.M3	+UE	电源 ECU
48.M4	KL15	点火 (KL15)

引脚分配 变体 2, 3, 5

引脚分布 32 针接口

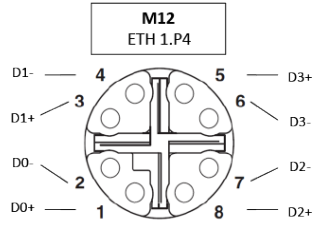
Pin No	功能型号名称	描述
32.A1	CAN1_H	CAN bus 1 high
32.A2	CAN1_L	CAN bus 1 low
32.A3	CAN2_H	CAN bus 2 high
32.A4	CAN2_L	CAN bus 2 low
32.B1	IACV_02	模拟量输入 IACV
32.B2	IDA35V_04	复合功能型输入 IDA35V
32.B3	IDA5V_01	复合功能型输入 IDA5V
32.B4	Uext_5V	传感器电源
32.C1	IDA5V_02	复合功能型输入 IDA5V
32.C2	IACV_01	模拟量输入 IACV
32.C3	Uext_5-12V	传感器电源
32.C4	AGND	模拟量接地
32.D1	IDA35V_03	复合功能型输入 IDA35V
32.D2	AGND	模拟量接地
32.D3	AGND	模拟量接地
32.D4	IACV_04	模拟量输入 IACV
32.E1	Uext_5-12V	传感器电源
32.E2	Uext_5V	传感器电源
32.E3	IACV_03	模拟量输入 IACV
32.E4	IDA5V_03	复合功能型输入 IDA5V

引脚分布 32 针接口

Pin No	功能型号名称	描述
32.F1	IDA35V_02	复合功能型输入 IDA35V
32.F2	IDA5V_04	复合功能型输入 IDA5V
32.F3	IDA35V_01	复合功能型输入 IDA35V
32.F4	KL15	点火 (KL15)
32.G1	OPHSP4A_03	数字PWM高边输出 OPHSP4A
32.G2	OPHSP4A_04	数字PWM高边输出 OPHSP4A
32.G3	+UB	电源输出
32.G4	GND	ECU 接地
32.H1	OPHSP4A_01	数字PWM高边输出 OPHSP4A
32.H2	OPHSP4A_02	数字PWM高边输出 OPHSP4A
32.H3	+UB	电源输出
32.H4	+UE	电源 ECU

引脚分配 变体 2, 3, 5

引脚分布 8 针 M12接口



Pin No	功能型号名称	BIOS 定义
1	ETH1_P4_D0+	X_ETH_SWI_ETH1_PORT4
2	ETH1_P4_D0-	
3	ETH1_P4_D1+	
4	ETH1_P4_D1-	
5	ETH1_P4_D3+	
6	ETH1_P4_D3-	
7	ETH1_P4_D2-	
8	ETH1_P4_D2+	

认证

合规信息

标准	描述	参数
ISO/IEC 17050-1	根据	见 Declaration of Conformity
EN ISO 13849-1:2015	机械安全	PL d / Cat. 2
IEC 61508:2010	安全型	SIL 2
KBA (Kraftfahrt-Bundesamt)	认证 该认证的设备可以使用在任何12v或24V的电气系统车辆中	According UN ECE Regulation No. 10
2011/65/EU 2015/863/EU	RoHS Restriction of Hazardous Substances	
2006/42/EC	Machinery directive	

详细认证测试信息

CE - EN IEC 61000-6-2:2019

标准	Test	参数
EN IEC 61000-6-2:2019	Immunity for industrial environments	-
	DIN EN 61000-4-2 Electrostatic discharge immunity test - direct discharges	330 Ω / 150 pF, Contact discharge ± 4 kV Air discharge ± 8 kV
	DIN EN 61000-4-2 Electrostatic discharge immunity test - indirect discharges (HCP, VCP)	330 Ω / 150 pF, Contact discharge ± 4 kV
	DIN EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test	80 MHz to 1000 MHz -> 10V/m; 1.4 GHz to 6.0 GHz -> 3V/m; horizontal and vertical
	DIN EN 61000-4-4 Burst - supply lines (Electrical fast transient / burst immunity test)	± 1 kV, 5/50 ns tr/th, repetition frequency 5kHz or 100kHz
	DIN EN 61000-4-4 Burst - data lines (Electrical fast transient / burst immunity test)	± 1 kV, 5/50 ns tr/th, repetition frequency 5kHz or 100kHz
	DIN EN 61000-4-5 Surge - supply lines (immunity test)	unsymmetrisch: '± 1 kV symmetrisch: '± 0,5 kV
	DIN EN 61000-4-5 Surge - data lines (immunity test)	unsymmetrisch: '± 1 kV
	DIN EN 61000-4-6 Conducted immunity - supply	150 kHz to 80 MHz, 10V

详细认证测试信息

CE - EN IEC 61000-6-2:2019

标准	Test	参数
	lines (Immunity to conducted disturbances, induced by radio-frequency fields)	
	DIN EN 61000-4-6 Conducted immunity - data lines (Immunity to conducted disturbances, induced by radio-frequency fields)	150 kHz to 80 MHz, 10V
	DIN EN 61000-4-8 magnetic field	50, 60 Hz, 30A/m
EN 61000-6-4:2007 + A1:2011	Emission standard for industrial environments	Conducted (CE) 0.15 MHz... .30 MHz Radiated (RE) 30 MHz ... 1000 MHz (6000MHz) 10m

Functional Safety - DIN EN 61326-3-1

标准	Test	参数
DIN EN 61326-3-1:2018	Tabelle 2 DIN EN 61000-4-2 - direct discharges Electrostatic discharge immunity test	330 Ω / 150 pF, Contact discharge ± 6 kV Air discharge ± 8 kV
	Tabelle 2 DIN EN 61000-4-2 - indirect discharges Electrostatic discharge immunity test	330 Ω / 150 pF, Contact discharge ± 6 kV
	Tabelle 2 DIN EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test	80 MHz to 1000 MHz, 20V/m; 1,4 GHz to 2 GHz, 10V/m 2,0 GHz to 2,7 GHz -> 3V/m; horizontal, vertical
	Tabelle 2 DIN EN 61000-4-8 magnetic field	30 A/m (No higher test levels will be applied)
	Tabelle 4 DIN EN 61000-4-4 Burst - supply lines (Electrical fast transient / burst immunity test)	± 3 kV, 5/50 ns tr/th, repetition frequency 5kHz
	Tabelle 5 DIN EN 61000-4-4 Burst - data lines (Electrical fast transient / burst immunity test)	± 2kV, 5/50 ns tr/th, repetition frequency 5kHz
	Tabelle 4 DIN EN 61000-4-5 Surge - supply lines (immunity test)	unsymmetrisch: ' ± 2 kV symmetrisch: ' ± 1 kV

详细认证测试信息

Functional Safety - DIN EN 61326-3-1

标准	Test	参数
	Tabelle 5 DIN EN 61000-4-5 Surge - data lines (immunity test)	unsymmetrisch: ± 2 kV
	Tabelle 4 DIN EN 61000-4-6 Conducted immunity - supply lines (Immunity to conducted disturbances, induced by radio-frequency fields)	150 kHz to 80 MHz, 10V
	Tabelle 5 DIN EN 61000-4-6 Conducted immunity - data lines (Immunity to conducted disturbances, induced by radio-frequency fields)	150 kHz to 80 MHz, 10V
	Tabelle 4 IEC 61000-4-16 Conducted common-mode voltages Supply lines	1 V to 10 V, 20 dB/Decade (1,5 kHz to 15 kHz) 10 V (15 kHz to 150 kHz) 10 V (constant with direct current, $16^{2/3}$ Hz, 50 / 60 Hz and 150 / 180 Hz) 100 V short period (1 s, with direct current, $16^{2/3}$ Hz and 50 / 60 Hz)
	Tabelle 5 IEC 61000-4-16 Conducted common-mode voltages signal lines	1 V to 10 V, 20 dB/Decade (1,5 kHz to 15 kHz) 10 V (15 kHz to 150 kHz) 10 V (constant with direct current, $16^{2/3}$ Hz, 50 / 60 Hz and

Functional Safety - DIN EN 61326-3-1

标准	Test	参数
		150 / 180 Hz) 100 V short period (1 s, with direct current, $16^{2/3}$ Hz and 50 / 60 Hz)
	Tabelle 4 IEC 61000-4-29 Votlage dips (Supply lines)	40 % U_T during 10 ms
	Tabelle 4 IEC 61000-4-29 Short interruptions (Supply lines)	0 % U_T during 20 ms

E1 - ECE R10

提示

E1 conformity is fulfilled as long as no "Immunity related functions" are controlled via the Ethernet channels, which are not connected via M12 connector, in the sense of ECE-R10 chapter 2.12.

详细认证测试信息

E1 - ECE R10

标准	Test	参数
UN ECE R10 Add. 9, Rev. 6 Annex 7	Radiated broadband emissions from ESAs CISPR25:2004	30 MHz ... 1000MHz
UN ECE R10 Add. 9, Rev. 6 Annex 8	Radiated narrowband emissions from ESAs CISPR25:2004	30 MHz ... 1000MHz
UN ECE R10 Add. 9, Rev. 6 Annex 9	Immunity of ESAs to electromagnetic radiation General: ISO 11452-1:2005 ALSE: ISO 11452-2:2004 BCI: ISO 11452-4:2011 (Stripline and TEM alternative test methods)	General 20MHz ... 2000MHz 20 MHz ... 800MHz: AM 800 MHz ... 2000 MHz: PM BCI: 20 MHz ... 400 MHz, 60mA (substitution (150mm) or closed loop (900mm) method allowed) Antenne, ALS E (vert): 200 MHz ... 800 MHz, 30 V/ m, AM 800 MHz ... 2000 MHz, 30 V/m, PM
UN ECE R10 Add. 9, Rev. 6 Annex 10	Conducted transient emission from ESAs on 12 V supply lines ISO 7637-2:2004	slow/fast: pos: +75 V neg: -100V
	Conducted transient emission from ESAs on 24V supply lines ISO 7637-2:2004	slow/fast: pos: +150 V neg: -450V
	Electrical transient conduction along supply lines	Pulse 1 - 75V, 5000 pulses t1 = 0,5s to 5s

E1 - ECE R10

标准	Test	参数
	12V System, Level 3 ISO 7637-2:2004	Pulse 2a 37V, 5000 pulses t1 = 0,2s to 5s
		Pulse 2b 10V, 10 pulses td = 0,2s to 2s
		Pulse 3a -112V, 1hr
		Pulse 3b 75V, 1hr
		Pulse 4 Us = -6V Ua = -2,5V to -6V 1 pulse
	Electrical transient conduction along supply lines 24V System, Level 3 ISO 7637-2:2004	Pulse 1 - 450V, 5000 pulses t1 = 0,5s to 5s
		Pulse 2a 37V, 5000 pulses t1 = 0,2s to 2s
		Pulse 2b 20V, 10 pulses td = 0,2s to 2s
		Pulse 3a -150V, 1hr
		Pulse 3b +150V, 1hr

详细认证测试信息

E1 - ECE R10

标准	Test	参数
		Pulse 4 Us = -12V Ua = -5V to -12V 1 pulse

Electrical Safety

标准	Test	参数
ISO 16750-2:2012-11	Direct current supply voltage	Operation at Tmax with maximum and minimum voltage Operation at Tmin with maximum and minimum voltage
	Overvoltage - Systems with 12 V / 24 V nominal voltage - 12 V Systems	18 V for 60 min. at 20 °C below Tmax 24 V for 60 s at room temperature
	Overvoltage - Systems with 12 V / 24 V nominal voltage - 24 V Systems	36 V for 60 min. at 20 °C below Tmax
	Superimposed alternating voltage - 12 V Systems	Usmax = 16 V (for $U_N = 12$ V) Sweep duration: 120 seconds Number of sweeps: 5 Severity 1, 2, 4
	Superimposed alternating voltage - 24 V Systems	Usmax = 32 V (for $U_N = 24$ V) Sweep duration: 120 seconds Number of sweeps: 5 Severity 1, 2, 3
	Slow decrease and increase of supply voltage	Decrease supply voltage from Usmin to 0 V and increase it from 0 V to Usmin. Applying a change

详细认证测试信息

Electrical Safety

标准	Test	参数
		rate of (0.5 ± 0.1) V per minute
	Discontinuities in supply voltage - Momentary drop in supply voltage - 12 V Systems	Drop to 4.5 V for ≤ 100 ms
	Discontinuities in supply voltage - Momentary drop in supply voltage - 24 V Systems	Drop to 9 V for ≤ 100 ms
	Discontinuities in supply voltage - Reset behavior voltage drop	Decrease supply voltage from U_{smin} in 5 % steps
	Discontinuities in supply voltage - Starting profile 12 V code C	Voltage cranking; Level 1
		Voltage cranking; Level 2
		Voltage cranking; Level 3
		Voltage cranking; Level 4
	Discontinuities in supply voltage - Starting profile 24 V code E	Voltage cranking; Level 1
		Voltage cranking; Level 2
		Voltage cranking; Level 3
	Discontinuities in supply voltage- Load Dump - Pulse B - 12 V System	with centralized load dump suppression 5 Pulses
	Discontinuities in supply voltage- Load Dump - Pulse B - 24 V System	with centralized load dump suppression 5 Pulses
	Reversed voltage - Case 1 - 12 V Systems	Unom. = 12 V -> Case 1 - Test Voltage = - 4 V

Electrical Safety

标准	Test	参数
		reversed polarity Duration: 60 s
	Reversed voltage - Case 2 - 12 V Systems	Unom. = 12 V -> Case 2 - Test Voltage = - 14 V reversed polarity Duration: 60 s
	Reversed voltage - Case 2 - 24 V Systems	Unom. = 24 V -> Case 2 - Test Voltage = 28 V reversed polarity Duration: 60 s
	Ground reference and supply offset - 12 V Systems	± 1 V offset; only required if two or more power supplies exist; Low-Side-Sensor must be connected to ground point at ECU connector
	Ground reference and supply offset - 24 V Systems	± 1 V offset; only required if two or more power supplies exist; Low-Side-Sensor must be connected to ground point at ECU connector
	Open circuit tests - Single line interruption - 12 V Systems	Interruption of each single Output for (10 ± 1) s.
	Open circuit tests - Single line interruption - 24 V Systems	Interruption of each single Output for (10 ± 1) s.
	Open circuit tests - Multiple line interruption - 12 V Systems	Disconnect the DUT for (10 ± 1) s.

详细认证测试信息

Electrical Safety

标准	Test	参数
	Open circuit tests - Multiple line interruption - 24 V Systems	Disconnect the DUT for (10 ± 1) s.
	Short circuit protection - signal circuits	Connect every In- and Output to maximum supply voltage (U _{max}) and Ground for 1 minute various modes necessary
	Short circuit protection - load circuits (supply lines)	to load circuits

Electromagnetic Compatibility (E1)

标准	Test	参数
ISO 7637-2: 2011	Conducted transient emission from ESAs on 12 V supply lines, Level 3 ISO 7637-2:2011	slow+: +37 V slow-: -75 V fast+: +75 V fast-: -112 V
	Conducted transient emission from ESAs on 24 V supply lines, Level 3 ISO 7637-2:2011	slow+: +37 V slow-: -150 V fast+: +150 V fast-: -150 V
	Electrical transient conduction along supply lines - 24 V System, Level 4	Pulse 1 -600 V, 500 pulses t ₁ ≥ 0,5 s
		Pulse 2a +112 V, 500 pulses t ₁ = 0,2 s to 5 s
		Pulse 2b +20 V, 10 pulses t _d = 0,2 s to 2 s
		Pulse 3a -300 V, 1 h
		Pulse 3b +300 V, 1 h

详细认证测试信息

Environmental Qualification

标准	Test	参数
DIN EN 50102:1997-09	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code).	IK7 Impact energy (joules): 2
ISO 4892-2:2013-06	Exposure from Xenon-arc lamps	Method A - Testing with filters for global radiation - Cycle no. 1, table 3
ISO 16750-3:2012	Resonance search	10Hz - 2000Hz, 1g, 0,5oct/min
	Test VII - Commercial vehicle, sprung masses	Vibration noise with temperature superimposition in case of natural frequencies of DUT upper 30Hz: random vibration acc IEC60068-2-64 from 10 Hz to 2000 Hz for 32 hrs each axis, Temperature cycle 8h from Tmin to Tmax
	Test VII - Commercial vehicle, sprung masses, Additional profile in the case of DUT natural frequencies < 30 Hz (Test VII)	random vibration acc IEC60068-2-64 from 10 Hz to 45 Hz for 32 hrs each axis, Temperature cycle 8 h from Tmin to Tmax
	Mechanical Shock - Test for devices on rigid points on the body and on the frame	in acc. IEC 60068-2-27 half-sinusoidal Acceleration 500 m/s ² Duration 6 ms room temperature 10 shocks per test direction

Environmental Qualification

标准	Test	参数
	Free fall (parts that may withstand falling without damages)	3 devices, 2 falls every device on the opposite side of the housing, drop height: 1 m to concrete ground or steel plate
ISO 16750-4:2010	Tests at constant temperature: Low temperature - storage	- 40°C for 24 hrs
	Tests at constant temperature: Low temperature - operation	Tmin for 24 hrs
	Tests at constant temperature: High temperature - storage	85°C for 48 hrs
	Tests at constant temperature: High temperature - operation	Tmax for 96 hrs
	Temperature step test	20°C to Tmin to Tmax, 5°C steps; *Perform functional tests (OM 3.2) when DUT has reached the new temperature with Usmin and Usmax
	Temperature cycling test	acc. to IEC 60068-2-14, Test Nb 30 cycles á 480 min , Tmin to Tmax Duration: 10 days *OM 3.2 for phases with electrical operation

详细认证测试信息

Environmental Qualification

标准	Test	参数
	Temperature cycling test - Rapid change of Temperature	acc. to IEC 60068-2-14, Test Na Transfer time \leq 30 sec.
	Ice water shock test - Splash water test	Heat the DUT at Tmax for the specified holding time t_h , then splash it with ice water (0 °C to +4 °C) for 3 sec.; (t_h = 1 hr or until temp. Stabilization is reached) 100 cycles each 66 Min.
	Salt spray test - Corrosion test	acc to IEC60068-2-52, Test Kb Severity: Severity 4 Cycle duration: 7 days Number of cycles: 2 cycles
	Salt spray test - Leakage and function	acc. to IEC60068-2-11, Test Ka Cycle duration: 24 hrs (8 hrs salt spray - 16hrs without spray) Number of cycles: 6 cycles
	Humid heat cyclic - Test 2: Composite temperature / humidity cyclic test	acc. to IEC60068-2-38, -Z/AD 10 cycles, upper temperature +65°C 93% r.H. 5 cycles with frost phase (-10°C); Duration: 11 days *OM 3.2 when the maximum cycle temperature is reached;
	Humid head cyclic - Test 3: Dewing test	In acc. To IEC 60068-2-38, Test Db Upper Temp.: 80°C, 5 cycles
	Damp heat, steady-state test	acc. to IEC60068-2-78; +40°C and 85% r.H. OM: 2.1 for 20 days 23 hrs

Environmental Qualification

标准	Test	参数
		OM: 3.2 for the last hour Duration: 21 days
	Corrosion test with flow of mixed gas	acc. to IEC60068-2-60, Test Ke, Method 4 Test cycle: 21 days in pollutant gas atmosphere (SO2, H2S, NO2, Cl2)
	Solar radiation	Confirmation of housing- and plug manufacturer about UV and OZON durability or test e.g. ISO 75220 or DIN EN 60068-2-5
	Dust Test	acc. to ISO 20653 Cycle duration: 20 min. Number of cycles: 20 cycles
	Protection against dust and water	ISO 20653
ISO 16750-5	Chemical resistance	Exposure time 24 h, Exposure condition 20 °C, 85 % relative humidity, Gasoline, Methanol, Battery acid, Protective lacquer, Windshield washer fluid, Vehicle washing chemicals, Cold cleaning agent, Cleaning solvent, Denatured alcohol, Runway de-icer, Aceton Exposure time 24 h Exposure condition 125 °C, 85 % relative humidity Diesel fuel, Diesel fuel "Bio", Engine oil, Transmission fluid, Automatic transmission oil, Hydraulic oil, Greasees, Silicone

详细认证测试信息

Environmental Qualification

标准	Test	参数
		oil, Brake fluid, Antifreeze fluid, Urea, Protective lacquer remover, Contact spray
ISO 20653:2013-02	IP Protection	IP6k6k, IPx7, IPx9k