

TDS OPUS B4-Eco

TDS OPUS B4-Eco, 26.09.2019

1 Order Numbers	OPUS B4-Eco Basic*
OPUS Projektor	
	OPUSB4EN1CANB000
	OPUSB4EN1CANT000 (+ Touch)
Codesys	
	OPUSB4EN1CDSB000
	OPUSB4EN1CDST000 (+ Touch)
	OPUS B4-Eco Full**
OPUS Projektor	
	OPUSB4EN1CANF000
	OPUSB4EN1CANA000 (Automotive Ethernet)
Codesys	
	OPUSB4EN1CDSF000
	OPUSB4EN1CDSA000 (Automotive Ethernet)
ISO-Horizon	
	OPUSB4EN1UTSF000
	OPUSB4EN1UTSA000 (Automotive Ethernet)
	OPUSB4EN1UTMF000
	OPUSB4EN1UTMA000 (Automotive Ethernet)
	OPUSB4EN1UTLF000
	OPUSB4EN1UTLA000 (Automotive Ethernet)

* Functions as described in black font

** Functions as described in black font except where grey font is available

2 Mechanical			
2.1 Dimensions	Width: ~195mm		
	Height: ~128mm		
	Depth: ~41mm		
2.2 Housing	Aluminum die cast Powder coated Front-glass or Touchscreen		
2.3 Mounting	landscape or portrait standalone in-dash		
2.4 Temperature	Operating Temperature: -30°C to +75°C		
	Storage Temperature: -40°C to +85°C		
3 Display			
Type	TFT Color Graphic LCD with LED backlight		
Size	7", 152.4mm (W) x 91.44mm (H)		
Resolution	800 x 480px (WVGA), 15:9		
Colors	16.7Mio		
Brightness	typ. 800cd/m ²		
Contrast Ratio	typ. 700:1		
Bonding	The display is either bonded to the touch-screen or the glass		
4 Input Devices			
4.1 Touch	Projected Capacitive Touch (Multitouch)		
4.2 Sensor	1 Light sensor		
5 Electronics			
5.1 Processor platform			
CPU	Freescale i.MX6®, Solo, 800MHz Freescale i.MX6®, Dual, 800MHz		
Mass storage	≥4 GByte (approx. 1400MB for customer use)		
RAM	512Mbyte 1Gbyte		
5.2 Power Supply			
Concept	System supplied through terminal 30 (battery +, see pinout) and 31 (battery -, see pinout). Terminal 15 (ignition) to be used to switch on/off.		
Operating voltage range	8 ... 36 V DC		
Protection	Short-circuit, overvoltage, inverse polarity		
Max. current consumption (without external load)	Power Mode	current at 13,5 V	current at 27 V
	On	TBD	TBD
	Low-power	TBD	TBD
	Sleep	TBD	TBD
	Off	TBD	TBD

5.3 Indicators	1 Multi-Color LED (free programmable)
5.4 Speaker	Up to 90dB @ 10cm distance (max. @ ~8kHz)
5.5 Audio	1 x Audio output (left, right, GND) AC97 compatible Output power: approx. 50mW
5.6 RTC	Buffered by gold cap Buffered for 2 weeks at T _{ambient} Deviation: max. 1s/day
5.7 Silent-Wake-Input	Input which can be used for Silent-Wake-On of the OPUS to reduce visible boot-time
	Active on positive edge
5.8 Interfaces	
5.8.1 Can Interface	2 x CAN-Interface (including CAN-Wake)
Type	ISO 11898, CAN-specification 2.0 B active
Speed	Default: 250kbit/s Possible: 10kbit/s, 20kbit/s, 50kbit/s, 83.3kbit/s, 111.11kbit/s, 250kbit/s, 500kbit/s, 800kbit/s and 1Mbit/s
5.8.2 RS232	1 x RS232-Interface
Type	EIA232 (only RxD, TxD, GND)
Speed	max. 115.200baud
5.8.3 USB	Host 2.0
Side connector	1 x Type A Connector High Speed Guaranteed 900mA @ 5V
Back connector	1 x Type A Connector High Speed Guaranteed 900mA @ 5V
5.8.4 Wireless-Interface	Via the USB Back connector, a wireless interface can be optional added. E.g. LM816 for WIFI
5.8.5 Ethernet-Interface	1 x 10/100 Mbit/s Base T Alternative: 1 x Automotive Ethernet Interface
5.8.6 Video-Interface	1 x analog video input, 1V _{ss} Camera control output (open drain) for special functionality (mirror, shutter, heating etc.) Camera supply output guaranteed 300mA @ 12VDC
6 Connections	
Main connector	Tyco-AMP 1437288-6 Mating connector (customer) Tyco-AMP 3-1437290-7 Mating crimp contact (customer) Tyco AMP 3-1447221-4

	For industrial use cable length should be less than 30m
Video connector	M12 round connector, female, 5-pole, B-coded acc. to EN 61076-2-101
Ethernet connector	M12 round connector, female, 4-pole, D-coded acc. to EN 61076-2-101
Connector pinout	See chap. 9.
7 Software	
7.1 Operating System	Linux, kernel 4.14.0 or higher
7.2 Application Programming	OPUS Projektor Tool Optional: Codesys Tool Optional: C/C++ Optional: ISO-Horizon

8 Testing and Verification

8.1 CE-Compliance

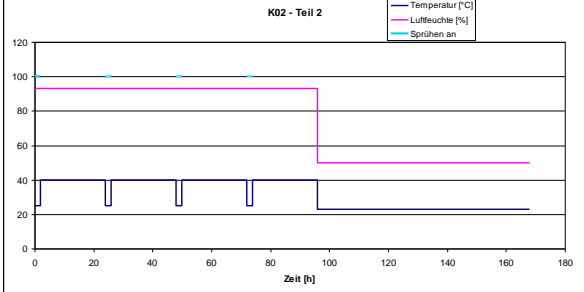
EU Directive 2014/30/EU (EMC) according to

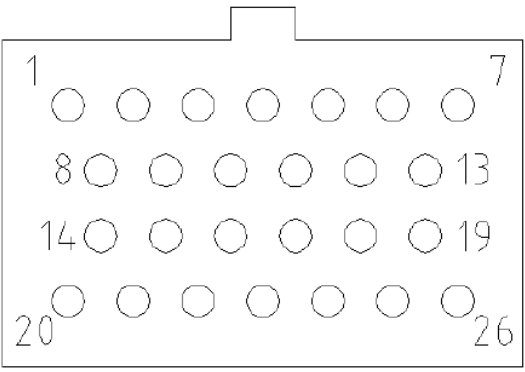
- EN 13766-1: Earth-moving and building construction machinery - Electromagnetic compatibility (EMC) of machines with internal electrical power supply - Part 1: General EMC requirements under typical electromagnetic environmental conditions
- EN ISO 14982: Agricultural and forestry machinery - Electromagnetic compatibility - Test methods and acceptance criteria
- EN 50498: Electromagnetic compatibility (EMC). Product family standard for aftermarket electronic equipment in vehicles
- EN 61000-6-2: Electromagnetic compatibility (EMC) - Generic standards - Immunity for industrial environments
- EN 61000-6-4: Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments

EMC Emission radiated	<p>30–75MHz: 62-52¹dB(μV/m) – QP – 120kHz 52-42¹dB(μV/m) – AV – 120kHz 75-400MHz: 52-63²dB(μV/m) – QP – 120kHz 42-53²dB(μV/m) – AV – 120kHz 400-1000MHz: 63dB(μV/m) – QP – 120kHz 53dB(μV/m) – AV – 120kHz 1000-2500MHz: 73dB(μV/m) – P – 120kHz 53dB(μV/m) – AV – 120kHz 2500-6000MHz: 80dB(μV/m) – P – 1000kHz 60dB(μV/m) – AV – 1000kHz</p> <p>QP: Quasi-Peak AV: Average P: Peak 1: Value decreases linearly with the logarithm of the frequency. 2: Value increases linearly with the logarithm of the frequency.</p>
EMC Immunity radiated	<p>20MHz to 800MHz with amplitude modulation 800MHz to 6GHz with pulse modulation</p> <p>30V/m for the radiated field (absorber lined chamber) testing method (ISO 11452-2) in vertical and horizontal polarization OR/AND 60mA for the Bulk Current Injection (BCI) testing method (ISO 11452-4)</p>
EMC Emission conducted	<p>12V-System (Maximum values): Positive slow pulses: +37V Negative slow pulses: -75V Positive fast pulses: +75V Negative fast pulses: -112V 24V-System (Maximum values): Positive slow pulses: +37V Negative slow pulses: -150V Positive fast pulses: +150V Negative fast pulses: -150V</p>
Test Pulse 1	<p>12V-System: 24V-System: Us=-112V; FS: C Us=-450V; FS: C</p>
Test Pulse 2a	<p>12V-System: 24V-System: Us=+55V; FS: B Us=+55V; FS: B</p>

Test Pulse 2b	12V-System: Us=+10V; FS: C	24V-System: Us=+20V; FS: C	
Test Pulse 3a	12V-System: Us=-165V; FS: A	24V-System: Us=-220V; FS: A	
Test Pulse 3b	12V-System: Us=+112V; FS: A	24V-System: Us=+220V; FS: A	
Test Pulse 4 (Starting profile)	12V-System: Us ₆ =6V; Us=6.5V; FS: B	24V-System: Us ₆ =6V; Us=10V; FS: B	
Load Dump	12V-System: Us=+79V; FS: C	24V-System: Us=+151V; FS: C	
Electrostatic Discharge	+/- 8kV contact discharge; FS: A +/- 15kV air discharge; FS: A		
EMV Susceptibility conducted	Frequency: 150kHz-80MHz; U=10V; AM: 1kHz, 80%; FS: A		
Burst	t _r =5ns; t _d =50ns; Burst duration: 15ms; Period: 300ms; t=5min; FS: B Power-lines: U _S =+/-2kV Signal-lines: U _S =+/-1kV		
Surge	t _r =1.2us; t _d =50us; Amount: 5; Wait-time: 60s; FS: B Power-lines: U _S =+/-0.5kV		
8.2 E1 Type approval	EU Directive ECE R 10		
8.3 Protection Level (IP Code)	IP6k6 according to ISO 20653: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access		
8.4 Electrical	12 and 24V-Systems according to:		
Inverse Polarity resistance	5min @ -48V (no defect)		
Over voltage resistance	5min @ +48V (no defect)		
Start behavior	Start over Temperature Start at T _{Room} ; decrease in 5°steps to T _{Min} ; go to T _{Room} ; increase in 5°steps to T _{High} ; Start DUT at each T; Successful start expected		
Short circuit strength	Connect each Pin of Main-, Video- and Ethernet-Connector for 5 Min to GND and for 5 Min to 36V; FS: C		
Superimposed alternating voltage	Triangle signal, frequency sweep: 50Hz-25kHz-50Hz inside 60s; FS: A		
	Level	12V	24V
	AC peak-to-peak U _{PP1}	1VAC	4VAC
	AC peak-to-peak U _{PP2}	2VAC	4VAC
	AC peak-to-peak U _{PP3}	4VAC	10VAC
De-/Increase Supply Voltage	Sweep Voltage U _{Min} -0V-U _{Min} with 0.5V/min; FS: D		
Drop in Supply Voltage	12V-System: U _{Start} =U _{Min} ; U _S =4.5V t _d =100ms; FS: B	24V-System: U _{Start} =U _{Min} ; U _S =9V t _d =100ms; FS: B	
Battery less Operation	12V-System: U ₁ =10V; U ₂ =18V; t=5min; FS: A	24V-System: U ₁ =20V; U ₂ =38V; t=5min; FS: A	

8.5 Mechanical	Vibration, noise	<table border="1"> <thead> <tr> <th>Frequency [Hz]</th> <th>PSD [(m/s²)²/Hz]</th> </tr> </thead> <tbody> <tr><td>10</td><td>20</td></tr> <tr><td>20</td><td>36</td></tr> <tr><td>30</td><td>36</td></tr> <tr><td>141</td><td>1.64</td></tr> <tr><td>200</td><td>1.93</td></tr> <tr><td>300</td><td>1</td></tr> <tr><td>2000</td><td>1</td></tr> </tbody> </table> <p>32h per axis; FS: A</p>	Frequency [Hz]	PSD [(m/s ²) ² /Hz]	10	20	20	36	30	36	141	1.64	200	1.93	300	1	2000	1							
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Mechanical shock	<p>Part 1: 300m/s², 18ms, 10 times per axis/direction; FS: A</p> <p>Part 2: 500m/s², 11ms, 3 times per axis/direction; FS: A</p> <p>Part 3: 500m/s², 6ms, 10 times per axis/direction; FS: A</p> <p>Part 4: 400m/s², 6ms, 4000 times per axis/direction; FS: A</p>																								
Drop test	<p>Drop the DUT on each side and each edge from a high of 1m on a concrete floor. No damage or visible damage</p>																								
Package drop test	<p>Drop the DUT inside the package on each side and each edge from a high of 1m on a concrete floor. No damage of the DUT No cracks to the package</p>																								

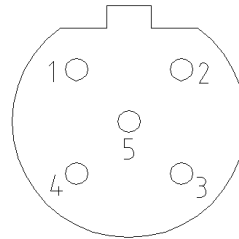
8.6 Climate	Salt spray resistance	<p>Part 1: 7 cycles at 24h (8h spraying; 16h rest) salt concentration: 5%</p> <p>Part 2: 4 cycles at 168H; 1 cycle:</p> 
	Chemical resistance	<p>Apply once a day, for three days, the following chemicals with a brush over the exposed surface. Inspect without rinsing immediately afterwards and after 100h. Alcohol, Antifreeze liquid (Ethyl-glycol), Diesel oil, Domestic Ammonia, Gasoline, Hydraulic oil 10W40, Liquid lime, Motor oil, NPK Chemical fertilizers 20 10 20, Windscreen cleaning mixture, Ammonium Nitrate and Ammonium Phosphate fertilizers, Bovine Effluent - (up to 5% propionic acid), Brake fluid - both mineral and vegetable types, Diesel fuel, STOU (Super Tractor Universal Oil) lubricating oil</p>
	Damp heat steady	21days @+40°C and 93%r.H.; FS: C
	Damp heat cyclic	6 cycles (each 24h); T _{Low} =+25°C; T _{High} =+55°C Humidity: >= 93%r.H.; FS: A
	Temperature/Humidity cyclic	10 cycles (each 24h); T _{Low} =-10°C; T _{High} =+65°C Humidity: = 80-96%r.H or uncontrolled.; FS: A
	Operating temperature	24h @ -30°C; FS: A 96h @ +75°C; FS: A
	Storage temperature	24h @ -40°C; FS: C 48h @ +85°C; FS: C
	Temperature cycling	30 cycles (each 8h); T _{Low} =-30°C; T _{High} =+75°C; FS: A
	Temperature shock	100 cycles (each 2h); T _{Low} =-30°C; T _{High} =+75°C; T _{change} : <30s; FS: C
	UV-resistance	Over-all time: 1500h Cycle: 8h UV at +60°C, 4h 95%r.H. No material damage, No visible change
FS: Function Status		

9 Pinout																																																																																		
9.1 Main connector pinout	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">pin no.</th> <th style="width: 30%;">assignment</th> <th style="width: 60%;">description</th> </tr> </thead> <tbody> <tr><td>1</td><td>VCC</td><td>Supply, Clamp 30</td></tr> <tr><td>2</td><td>Ignition</td><td>Wake-Input, Clamp 15</td></tr> <tr><td>3</td><td>GND</td><td>Supply, Clamp 31</td></tr> <tr><td>4</td><td>Wake</td><td>Wake Input, "Doorswitch"</td></tr> <tr><td>5</td><td>Audio Out_L</td><td>Audio line out, Stereo</td></tr> <tr><td>6</td><td>Audio Out_R</td><td>Audio line out, Stereo</td></tr> <tr><td>7</td><td>Audio GND</td><td>Audio line out, Ground</td></tr> <tr><td>8</td><td>CAN1H</td><td>CAN 1 - High</td></tr> <tr><td>9</td><td>CAN1L</td><td>CAN 1 - Low</td></tr> <tr><td>10</td><td>CAN2H</td><td>CAN 2 - High</td></tr> <tr><td>11</td><td>CAN2L</td><td>CAN 2 - Low</td></tr> <tr><td>12</td><td>-</td><td>-</td></tr> <tr><td>13</td><td>-</td><td>-</td></tr> <tr><td>14</td><td>-</td><td>-</td></tr> <tr><td>15</td><td>-</td><td>-</td></tr> <tr><td>16</td><td>RS232 RxD</td><td>RS232 Receive data</td></tr> <tr><td>17</td><td>RS232 TxD</td><td>RS232 Transmit data</td></tr> <tr><td>18</td><td>RS232 GND</td><td>RS232 Ground</td></tr> <tr><td>19</td><td>-</td><td>-</td></tr> <tr><td>20</td><td>-</td><td>-</td></tr> <tr><td>21</td><td>-</td><td>-</td></tr> <tr><td>22</td><td>-</td><td>-</td></tr> <tr><td>23</td><td>ENA</td><td>Service-Enable</td></tr> <tr><td>24</td><td>-</td><td>-</td></tr> <tr><td>25</td><td>-</td><td>-</td></tr> <tr><td>26</td><td>-</td><td>-</td></tr> </tbody> </table>	pin no.	assignment	description	1	VCC	Supply, Clamp 30	2	Ignition	Wake-Input, Clamp 15	3	GND	Supply, Clamp 31	4	Wake	Wake Input, "Doorswitch"	5	Audio Out_L	Audio line out, Stereo	6	Audio Out_R	Audio line out, Stereo	7	Audio GND	Audio line out, Ground	8	CAN1H	CAN 1 - High	9	CAN1L	CAN 1 - Low	10	CAN2H	CAN 2 - High	11	CAN2L	CAN 2 - Low	12	-	-	13	-	-	14	-	-	15	-	-	16	RS232 RxD	RS232 Receive data	17	RS232 TxD	RS232 Transmit data	18	RS232 GND	RS232 Ground	19	-	-	20	-	-	21	-	-	22	-	-	23	ENA	Service-Enable	24	-	-	25	-	-	26	-	-
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9.2 Video connector pinout

	Round Connector, 5 pins, M12
1	VidSig +
2	Switch
3	Power 12V
4	Power GND
5	VidSig GND

Video- Connector, M12, female, 5 pins, b-coded, view on rear side of the OPUS B3-Eco



9.3 Ethernet connector pinout

100Base-Tx

	Round Connector, 4 pins, M12
1	TD+
2	RD+
3	TD-
4	RD-

Automotive Ethernet

	Round Connector, 4 pins, M12
1	D+
2	n.c.
3	D-
4	n.c.

Ethernet Connector, M12, female, 4 pins, d-coded, view on rear side of the OPUS B3-Eco

