

FEATURES

- 12:1 Ultra Wide Input Range
- 14-160 Vdc Railway Input Range
- Efficiency up to 89%
- 30-50 Watt Isolated & Regulated Output
- Fixed Switching Frequency
- Remote ON/OFF
- 3000 Vdc
- Low No Load Power Consumption
- Over Voltage and Over Current Protection
- Over Temperature Protection
- Continuous Short Circuit Protection
- Build-In EMI Filter
- Shock & Vibration Meets EN50155 (EN61373)
- Meets UL60950-1 2nd (Basic Insulation)
- Railway Systems (meets EN50155 for EMC)
- Fire & Smoke meets EN45545-2
- Safety meets IEC/EN/UL 60950-1
- Chassis Mount, Baseplate Cooled



GENERAL DESCRIPTION

The VCD50R12-Series is a family of 30-50 Watt single DC/DC converters designed for application where isolated output is required from a distributed power system. These converters achieve baseplate cooling without compromising performance or field reliability.

Models operate from an ultra wide 12:1 input bus voltage of 72 Vdc offering output voltage levels of 5, 12, 24 and 48 Vdc. Typical applications are in railway systems for on board power distribution.

SELECTION GUIDE

Model No.	nominal Input Voltage Range [Vdc]	nominal Output Voltage [Vdc]	Output Current @ full load [A]	Input Current @ No Load [mA]	Input Current @ Full Load [mA]	Max. Capacitive Load [µF]	Eff.typ. [%]
VCD50R12-7205S	72 (16~160)	5	6.0	8	530	10000	83
VCD50R12-7212S		12	4.2	8	810	6800	87
VCD50R12-7224S		24	2.1	8	810	3300	89
VCD50R12-7248S		48	1.05	12	810	680	88

Options

Suffix -N: negative Logic (instead of positive Logic, which is standard without Suffix)
 Suffix -D: with Cover

Part Number Example: VCD50R12-7224S-N-D ... negative Logic with Cover
 VCD50R12-7224S ... positive Logic, Open Frame Version

INPUT SPECIFICATIONS						
Item	Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	72 Vin (nom)		14	72	160	Vdc
Under voltage Lockout	Turn-On Voltage Threshold	Full Load	14.2	14.6	15	Vdc
	Turn-Off Voltage Threshold	Full Load	11.6	12.6	13	
	Lockout Hysteresis Voltage	Full Load	-	2.0	-	
Maximum Input Current	Vin=16.8V, Full Load		5V Output	-	2.3	A
			others	-	4	
Notes:						
1) Input Voltage Range 14-16.8 Vdc (t<60 sec.)						
2) TVS is Included for Input Surge Voltage Protection						
3) Recommend an External Fuse for Input Reverse Polarity Protection (shunt diode is included inside)						

OUTPUT SPECIFICATIONS						
Item	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy	Vin=72V, Full Load, Tc=25°C		-1.0	-	+1.0	%
Line regulation	High Line to Low Line @ full load		-0.2	-	+0.2	%
Load regulation	Full Load to No Load		-0.2	-	+0.2	%
Ripple and noise (5Hz - 20MHz bandwidth)	Full Load, 1µF ceramic capacitor	Peek to Peek	-	100	-	mV
		RMS	-	40	-	
Temperature coefficient	Tc=-40°C to 100°C		-0.02	-	+0.02	%/°C
Over voltage protection	Limited Voltage, % of nominal Vo		115	125	140	%
Over current protection	Hiccup Mode, Auto Recovery		110	180	220	%
Short circuit protection	-		Continuous, Auto Recovery			
Output Voltage Trim Range	Po≤max rated power, Io≤Io_max		-20	-	+10	%
Output Voltage Remote Sense Range	Po≤max rated power, Io≤Io_max % of nominal Vo		-	-	+10	%

ABSOLUTE MAXIMUM RATINGS						
Item	Conditions		Min.	Typ.	Max.	Unit
Input Voltage	Continuous		-0.3	-	160	Vdc
Input Surge Voltage	100ms max.		-	-	200	Vdc
Operating Case Temperature	At the Center part of Base Plate		-40	-	100	°C
Storage Temperature	-		-40	-	105	°C

GENERAL SPECIFICATIONS						
Item	Conditions	Min.	Typ.	Max.	Unit	
Isolation voltage (100% factory Hi-Pot tested @2sec.)	1 minute; Input to Output	-	-	3000	Vdc	
	1 minute; Input to Case (Base Plate)	-	-	2250		
	1 minute; Output to Case (Base Plate)	-	-	500	Vac	
Isolation resistance	Input to Output	200	-	-	MΩ	
Isolation capacitance	Input to Output	-	3000	-	pF	
	Input to Case (Base Plate)	-	5000	-		
	Output to Case (Base Plate)	-	10000	-		
Switching frequency	-	215	240	265	kHz	
Thermal Shutdown	Temperature at the Center Part of Base Plate, Non-Latching	-	110	-	°C	
Over Temperature Recovery		-	110	-	°C	
MTBF	Io=100% of Io_max MIL-HDBK-217F, Notice 1, GB, 25°C	5 Vout	-	506	-	kHours
		12 Vout	-	484	-	
		24 Vout	-	515	-	
		48 Vout	-	513	-	
Weight	Open Frame Version	-	210	-	grams	
	Covered Version	-	296	-		
Base plate Material	Aluminium					
Potting Material	UL 94V-0 (DC Module)					
Shock/Vibration	EN50155 (EN61373) Compliant					
Humidity	95% RH max. Non Consensing					
Altitude	5000m Operating Altitude, 12000m Transport Altitude					
Thermal Shock	MIL-STD-810F					
Fire & Smoke	EN45545-2 Compliant					
EMI	EN55032 & EN50155 Compliant (with external output filter)			Class A		
ESD	EN61000-4-2 Level3: Air ±8kV, Contact ±6kV			Perf. Criteria A		
Radiated immunity	EN61000-4-3 Level3: 80~1000MHz, 20V/m			Perf. Criteria A		
Fast Transient	EN61000-4-4 Level3: On power input port, ±2kV			Perf. Criteria A		
Surge	EN61000-4-5 Level4: Line to earth, ±4kV, Line to line ±2kV			Perf. Criteria A		
Conducted immunity	EN61000-4-6 Level3: 0.15~80MHz, 10V			Perf. Criteria A		
Interruptions of Voltage Supply	EN50155	Class S3: 20ms interruptions		Perf. Criteria A		
Supply Change Over	EN50155	Class C2: During a supply break of 30ms		Perf. Criteria A		

ON/OFF CONTROL

Item	Conditions		Min.	Typ.	Max.	Unit
Positive Remote On/Off logic (refer to -Vin pin)	Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}=1.0\text{mA}$	0	-	1.2	V
	Logic High (Module On)	$V_{on/off}$ at $I_{on/off}=0.0\text{mA}$ (Pin open=On)	3.5	-	160	
Negative Remote On/Off logic (refer to -Vin pin)	Logic High (Module Off)	$V_{on/off}$ at $I_{on/off}=0.0\text{mA}$ (Pin open=On)	4.0	-	160	V
	Logic Low (Module On)	$V_{on/off}$ at $I_{on/off}=1.0\text{mA}$	0	-	1.2	
On/Off Current (for both logic)	$I_{on/off}$ at $V_{on/off}=0\text{V}$		-	0.3	1	mA
Leakage Current (for both logics)	Logic High, $V_{on/off}=15\text{V}$		-	-	30	μA
Off Converter Input Current	Shutdown input idle current		-	3	5	mA

DYNAMIC CHARACTERISTICS

Item	Conditions		Typ.	Max.	Unit
Output Voltage Current Transient	Error Band	75% to 100% of I_{o_max} step load change $d/d_r=0.1\text{A}/\mu\text{s}$	-	± 5	%
	Recovery Time		-	250	μsec
TurnOn Delay and Rise Time (Full load, constant resistive load)	Turn-On Delay Time, from On/Off Control	$V_{on/off}$ to 10% V_{o_set} Remote On	15	-	msec
	Turn-On Delay Time, from Input	V_{in_min} to 10% V_{o_set} Remote Up	15	-	
	Output Voltage Rise Time	10% V_{o_set} to 90% V_{o_set}	10	-	

Notes

1. Output connector CN3 wafer with TAIWAN KING PINTERMINAL P110I series and mate with JST housing PH series or equivalent.
2. CN1 & CN2 connection: DINKLE EK500V-04P series or equivalent, suitable electric wire: 24~12AWG (IEC 0.5~2.5 mm²)
3. Refer to Applicatin Note for Thermal Resistance and Derating Information.
4. All specifications typical at nominal line, full load and 25°C; Unless otherwise noted;

IMMUNITY TO ENVIRONMENTAL CONDITIONS

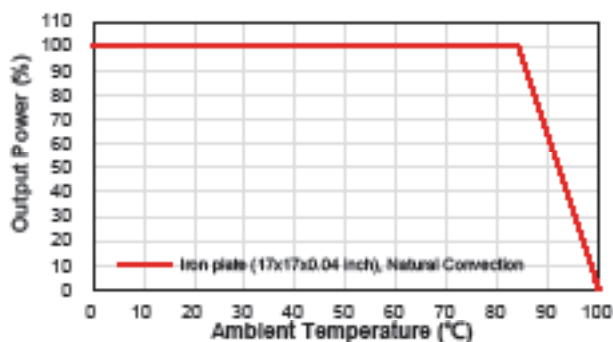
Phenomenon	EN50155; 2017 Reference Clause(s)	Reference Standard	Test Conditions	Result
Low Temperature Start-up test	13.4.4	EN 60068-2-1	Class OT4 Temperature: -40°C Duration: 2 Hrs	pass
Dry heat Test	13.4.5	EN 60068-2-2	Class OT4 & ST2 Temperature: 70°C Duration: 6 Hrs Extended Temperature: 85°C Extended Duration 10 min	pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40°C Duration: 16 hrs	pass
Cyclic Damp Heat Test	13.4.7	EN 600-2-30	Temperature: 25°C Humidity: 90~96% RH Duration: 48 hrs	pass
Random Vibration Test	3.4.11	EN 61373	Temperature: 26°C +/- 3°C Humidity: 50% +/-25% RH Frequency range: 5~150 Hz Vertical: 1.01 m/s ² Transverse: 0.450 m/s ² Longitudinal: 0.700 m/s ² Duration: 10 min/axis	pass
Simulated Long Life Test at Increased Random Vibration Levels	13.4.411	EN 61373	Temperature: 26°C +/- 3°C Humidity: 70% +/-5% RH Frequency range: 5~150 Hz Vertical: 5.72 m/s ² Transverse: 2.55 m/s ² Longitudinal: 3.96 m/s ² Duration: 5 hrs/axis	pass
Shock Test	13.4.11	EN 61373	Temperature: 26°C +/- 3°C Humidity: 70% +/-5% RH Frequency range: 5~150 Hz +/-Vertical: 30 m/s ² +/-Transverse: 30 m/s ² +/-Longitudinal: 50 m/s ² +/-Duration: 30ms x18 (Each axis 3 shocks)	pass

EN45545-2 FIRE & SMOKE TEST CONDITIONS

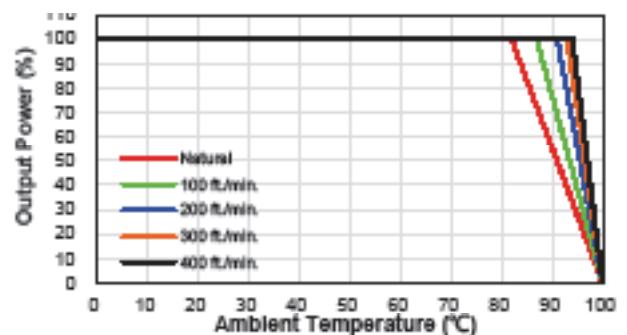
Item		Standard	Harard Level
R22	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545: 2013 EN IS 5659-2: 2013	HL1, HL2
	Smoke Toxicity Test	EN 45545-2:2013 NF X70-100: 2006	HL1, HL2, HL3
R23	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545: 2013 EN IS 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2:2013 NF X70-100: 2006	HL1, HL2, HL3
R24	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2	HL1, HL2, HL3
R25	Glow - Wire Test	EN 45545-2: 2013 EN 60695-2-11: 2001	HL1, HL2, HL3
R26	Vertical Flame Test	EN 45545-2: 2013 EN 60695-11-10: 2013	HL1, HL2, HL3

POWER DERATING CURVES

VCU50-72xxS (-D) Derating Curve with heatsink Iron Plate (Vin=72V)

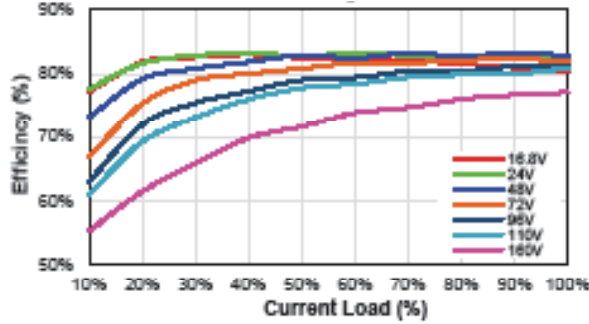


VCU50-72xxS (-D) Derating Curve with heatsink FBL254 (Vin=72V)

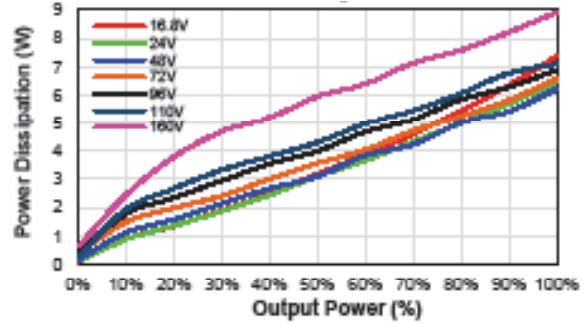


PERFORMANCE DATA CURVES

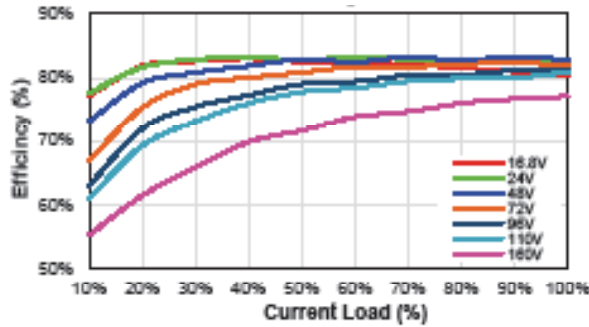
VCU50-7205S - Eff vs Io @25°C



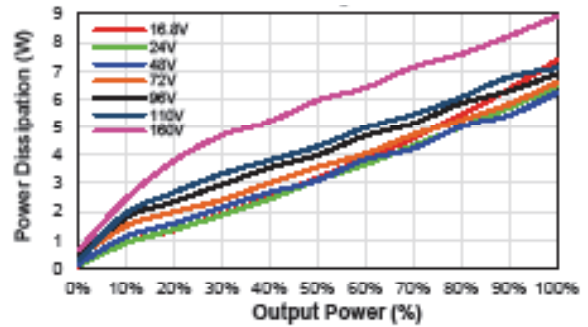
VCU50-7205S - Pd vs Po @25°C



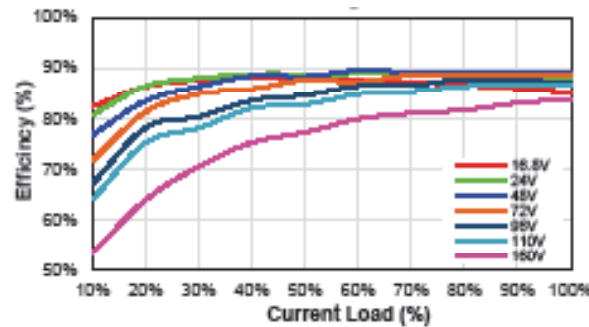
VCU50-7212S - Eff vs Io @25°C



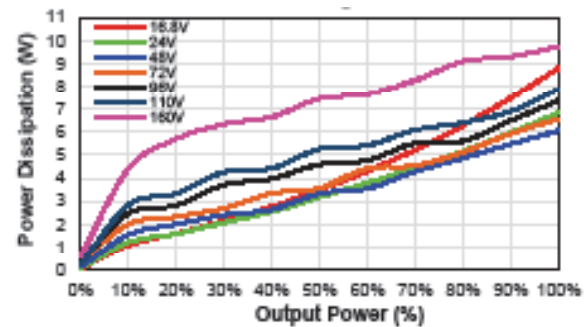
VCU50-7212S - Pd vs Po @25°C



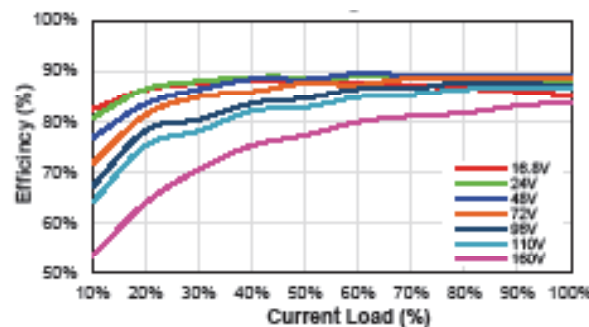
VCU50-7224S - Eff vs Io @25°C



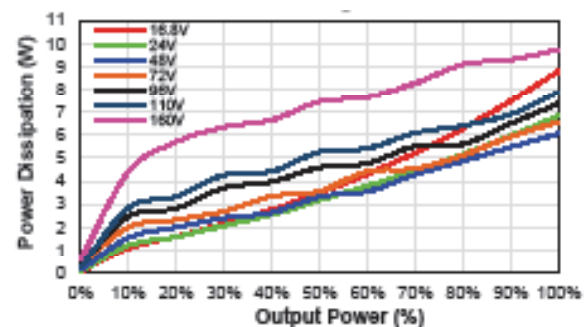
VCU50-7224S - Pd vs Po @25°C



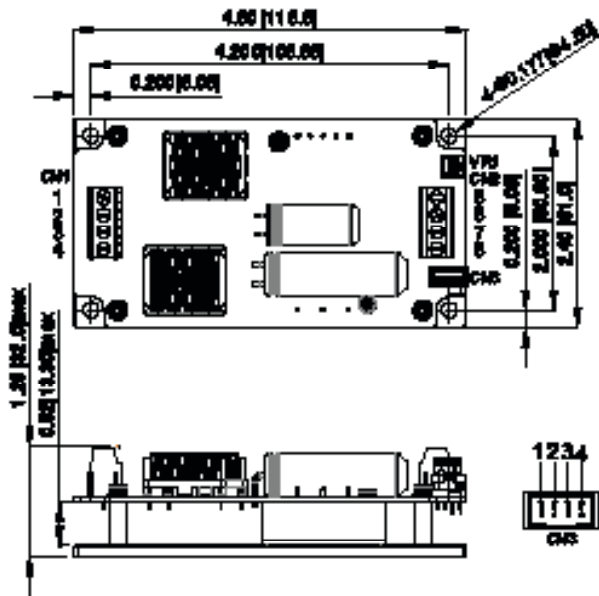
VCU50-7224S - Eff vs Io @25°C



VCU50-7224S - Pd vs Po @25°C



MECHANICAL DRAWING - Open Frame Version



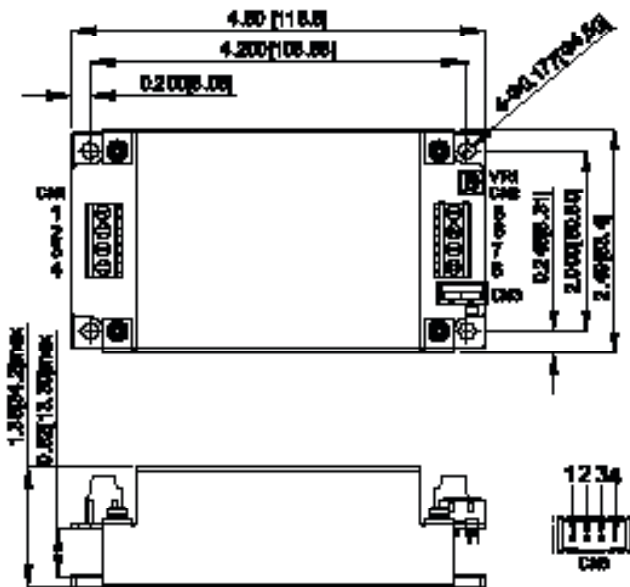
PIN CONNECTION CN3	
PIN	Function
1	-V Output
2	-Sense
3	+Sense
4	+V Output

PIN CONNECTION CN1 & CN2	
PIN	Function
1	+V Input
2	-V Input
3	Remote
4	Case
5	+V Output
6	+V Output
7	-V Output
8	-V Output

VR1
Output Voltage Adjustment

- All dimensions in inch [mm]
- Tolerance: x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004 [±0.10]

MECHANICAL DRAWING - with Cover (Option -C)



PIN CONNECTION CN3	
PIN	Function
1	-V Output
2	-Sense
3	+Sense
4	+V Output

PIN CONNECTION CN1 & CN2	
PIN	Function
1	+V Input
2	-V Input
3	Remote
4	Case
5	+V Output
6	+V Output
7	-V Output
8	-V Output

VR1
Output Voltage Adjustment

- All dimensions in inch [mm]
- Tolerance: x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004 [±0.10]

Note: Specifications can be changed without prior notice. Products are not intended for and must not be used in life support systems, human implantation, nuclear facilities or systems or any other application where product failure or malfunction of the component could lead to loss of life or catastrophic property damage.