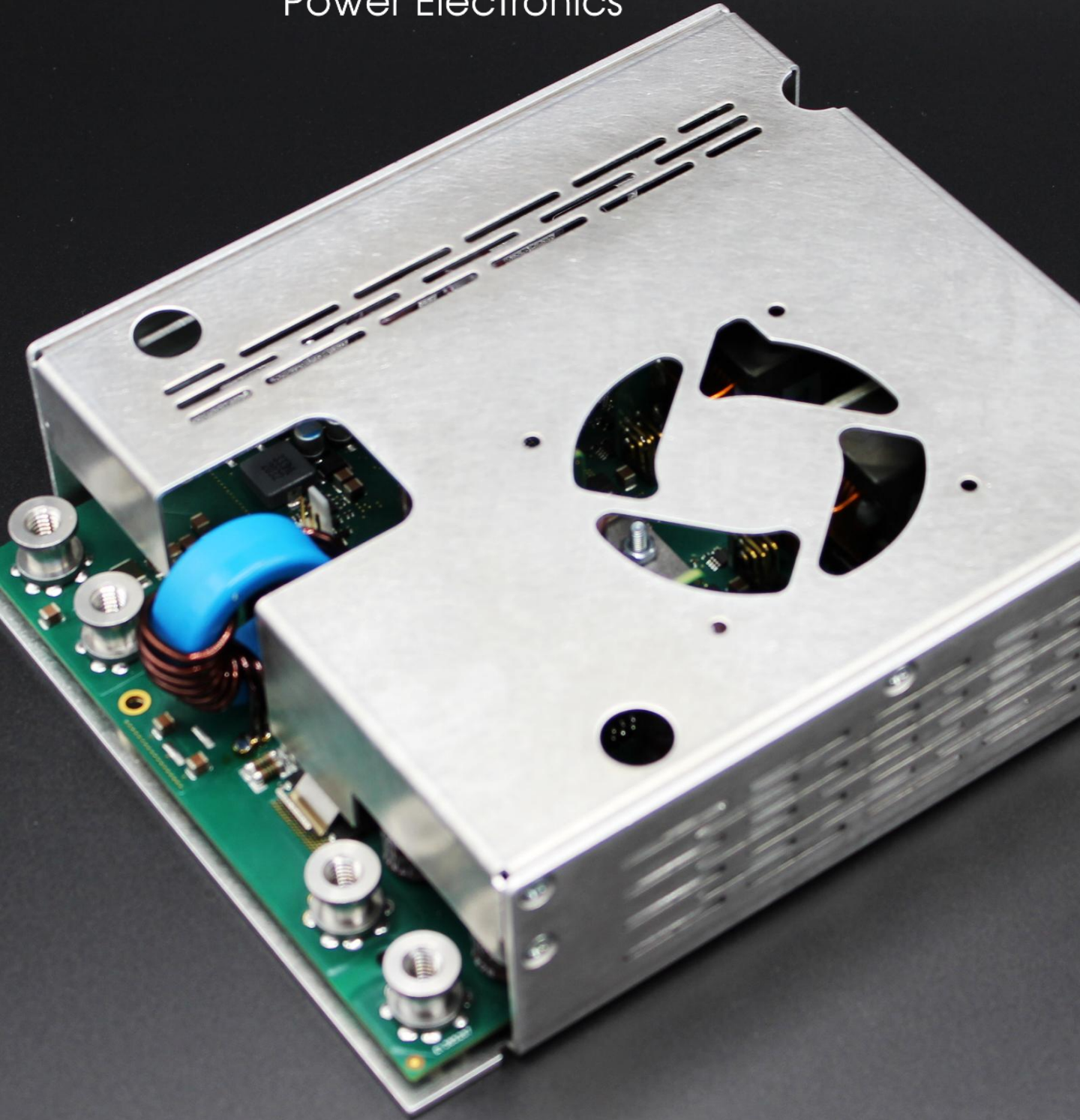




Querom

Power Electronics



DDL2148-24

48V bidirectional DC/DC converter

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Description

The DDL2148-24 is a non-isolated, low voltage, high-power DC/DC converter that manages energy transfer between two ports (Port A and Port B) bidirectionally. When transferring power from Port A to Port B, the converter functions in buck mode, providing a lower voltage level at Port B. In the opposite direction, the converter operates in boost mode, increasing the voltage level on Port A.

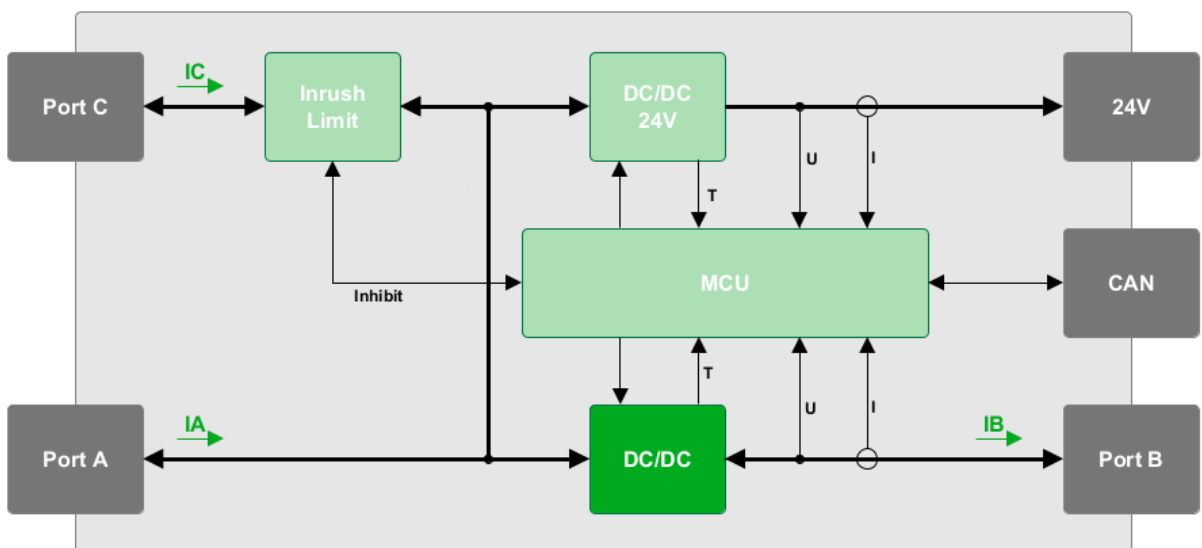
The dedicated input Port C, connected in parallel to Port A, features a circuit that limits inrush current. This prevents a connected power supply from experiencing high current loads during startup.

An additional +24V constant voltage output serves as a power supply for numerous applications. The CAN interface allows for individual adjustment of various parameters. The device incorporates several safety features, including protection against overvoltage, overcurrent, and overtemperature.



- Energy recovery (Recuperation)
- Programmable input/output
- High efficiency
- Remote control (CAN)
- Overload protection
- Low standby power consumption
- Port A input current up to 100A
- Port B input current up to -85A
- Inrush current limitation (Port C)
- Auxiliary 24V output

Technical Data Sheet



Converter basic principle

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Specification

The following parameters are valid for operation at 25°C and under nominal conditions, unless specifically stated otherwise. Nominal condition includes in particular $U_C > U_B$, $U_A > U_B$ and $U_A > 20V$.

General

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Overvoltage tol.						
Port A	$U_{A,pk}$	60	-	-	V	10s, No protection against reverse current
Port B	$U_{B,pk}$	60	-	-	V	
Port B Sense	$U_{Bsns,pk}$	60	-	-	V	
Port C	$U_{C,pk}$	60	-	-	V	
24V	$U_{24V,pk}$	27	-	-	V	
Inrush Current						
Port A	$I_{A,Inrush}$	-	-	$I_{A,nom,max}$	A	not actively limited
Port B	$I_{B,Inrush}$	-	-	$I_{B,nom,max}$	A	not actively limited
Dropout	$U_{A,B,Drop}$	-	-	2	V	$(U_{A,C} - U_B)$ at $I_{B,nom,max}$
Efficiency						
Port A to Port B	$\eta_{A,B}$	96	97	-	%	for $I_B > 0.5 \cdot I_{B,nom,max}$
Port B to Port A	$\eta_{B,A}$	94	95	-	%	for $I_{A,C} < 0.5 \cdot I_{A,nom,min}$
24V	η_{24V}	95	97	-	%	for $P_{24V} > 0.3 \cdot P_{24V,nom}$
Withstand Voltage Ports A,B,C to Case	$U_{Iso,wth}$	100	-	-	V	
Impedance Ports A,B,C to Case	Z_{Iso}	-	28		uF	Depending on EMC
Startup time ⁽¹⁾	t_{Setup}	-	-	1.5	s	

(1) Startup time is defined as the timespan between $U_{A,nom,max} > U_A > U_{A,nom,min}$ and start of operation of Ports A,B and 24V outputs.

Port A

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Voltage	$U_{A,nom}$	20	-	55	V	pk-pk, 20MHz, 47uF
Ripple&Noise	$U_{A,Ripple}$	-	-	500	mV	
Load Regulation	$dU_{A,Load}$	-1.0	-	1.0	V	
Line Regulation	$dU_{A,Line}$	0.25	-	0.25	V	
Current	$I_{A,min}$	-	-	-	A	$I_{A,min} = \eta \cdot (U_{B,min} \cdot I_{B,Set}) / U_{A,Set}$
Load transient						
Deviation	$d_{A,trans}$	-10	-	10	%	Load Jump 80/20%
Recovery	$t_{A,trans}$	-	-	200	ms	Relative to $U_{A,Set}$

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Port B

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Start Voltage	$U_{B,Start}$	14	-	-	V	MCU Wakeup Voltage without previous operation
Voltage	$U_{B,nom}$	0	-	55	V	Fully operational While $U_A > U_{A,nom,min}$ pk-pk, 20MHz, 47 μ F
Input	$U_{B,in,nom}$	22	-	55	V	
Derated Input. ⁽¹⁾	$U_{B,in,min}$	-	2	-	V	
Ripple&Noise	$U_{B,Ripple}$	-	-	200	mV	
Current	$I_{B,nom}$	-85	-	100	A	

(1) Available Power is limited by $U_B \cdot I_{B,nom,min}$

Port C

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Voltage	$U_{C,nom}$	20	-	55	V	Fully operational
Current	$I_{C,min}$	-	-	-	A	$I_{C,min} = \eta \cdot (U_{B,min} \cdot I_{B,Set}) / U_{A,Set}$
Inrush Limiter Deactivation Volt.	U_{IL}	-	4	-	V	Voltage differential for inrush current limitation
Resistance	R_{IL}	-	50	-	Ω	Resistor is shorted at inrush current limitation end
End Delay	t_{IL}	-	1	-	s	

24V Output

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Voltage	$U_{24V,nom}$	-	24	-	V	Fixed Line + Load + Setpoint pk-pk, 20MHz, 47 μ F
Tolerance	$dU_{24V,all}$	-0.72	-	0.72	V	
Ripple&Noise	U_{24V_Ripple}	-	-	200	mV	
Rise time ⁽¹⁾	t_{24V_rise}	-	-	100	ms	
Current	$I_{24V,cont}$	6.5	-	-	A	
Limit	$I_{24V,lim}$	-	-	8	A	
Power	$P_{24V,nom}$	150	-	-	W	

(1) Rise time is defined from the point of time where $U_A \geq U_{A,nom}$ is applied for $t > t_{Setup}$ and the point of time where $U_{24V} = U_{24V,nom} \pm dU_{24V,all}$

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Port A Control

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Voltage Setpoint	$U_{A,Set}$	20	-	53	V	CAN programmable
Tolerance	$dU_{A,Set}$	-1.0	-	1.0	V	
Resolution	$S_{A,Set,nom}$	-	10	-	mV/Bit	

Port B Control

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Input Current Setpoint	$I_{B,In,Set}$	-15	-	-85	A	CAN programmable
Tolerance	$dI_{B,In,Set}$	-5	-	5	A	
Resolution	$S_{I_{B,In,Set,nom}}$	-	10	-	mA/Bit	
Input Power Resolution	$P_{In,Set}$ $S_{P,In,nom}$	-3000	-	-300	W W/Bit	CAN programmable
Output Voltage Setpoint	$U_{B,Out,Set}$	6	-	50	V	CAN programmable
Tolerance	$dU_{B,Out,Set}$	-0.5	-	0.5	V	
Resolution	$S_{U_{B,Out,Set,nom}}$	-	10	-	mV/Bit	
Output Current Setpoint	$I_{B,Out,Set}$	15	-	100	A	CAN programmable
Tolerance	$dI_{B,Out,Set}$	-5	-	5	A	
Resolution	$S_{I_{B,Out,Set,nom}}$	-	10	-	mA/Bit	
Output Power Resolution	$P_{Out,Set}$ $S_{P,Out,nom}$	500	-	5000	W W/Bit	CAN programmable
Output Delay Resolution	$t_{Out,del,Set}$ $S_{t,Out,del,nom}$	100	-	5000	ms ms/Bit	CAN programmable

Port C Control

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Port C to A threshold	$U_{CA,thr,Set}$	900	-	5000	mV	CAN programmable
Resolution	$S_{UCA,thr,nom}$	-	10	-	mV/Bit	

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Monitoring

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Sense Resolution	n_{sns}	-	12	-	Bit	
Sense Bandwidth	f_{sns}	50	-	-	Hz	
Voltage Sense Tolerance	dU_{sns}	-0.5	-	0.5	V	
Slope	$S_{U_{\text{sns}},\text{nom}}$	-	10	-	mV/Bit	
Current Sense Port A tolerance	$dI_{A,\text{sns}}$	-10	-	10	A	for $I_B > 0.2 \cdot I_{B,\text{nom},\text{max}}$
Port B tolerance	$dI_{B,\text{sns}}$	-5	-	5	A	for $I_B > 0.2 \cdot I_{B,\text{nom},\text{max}}$
Slope	$S_{I_{\text{sns}},\text{nom}}$	-	10	-	mA/Bit	
Temperature Sense Tolerance	dT_{sns}	-5	-	5	°C	
Slope	$S_{T_{\text{sns}},\text{nom}}$	-	1	-	°C/Bit	

Environmental Conditions

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Storage Temperature	T_{Stor}	-25	-	60	°C	
Ambient Temperature	$T_{\text{amb},\text{nom}}$	0	-	80	°C	
Baseplate Temperature	$T_{\text{base},\text{nom}}$	0	-	55	°C	
Thermal Protection Limit	$T_{\text{Base,Prot}}$	60	-	-	°C	Converter will be deactivated above 60°C
Humidity	φ_{Nom}	20	-	95	%	Non-condensing
Airflow	V_{Air}	0	-	-	m/s	No Airflow

Mechanical

Parameter	Symbol	Value			Unit	Comment
		min.	typ.	max.		
Size						
Width	W	-	142.1	-	mm	Connectors mounted on short sides (W)
Height	H	-	45	-	mm	
Depth	D	-	183	-	mm	
Weight	M	-	1	-	kg	

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Certification

Parameter	Standard	Comment
Safety	EN62368-1	
Emission	EN61000-6-4	
Immunity	EN61000-6-2	Basic standards: EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11

Notice:

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without Querom's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless Querom, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of Querom products in such safety-critical applications.

Document history

Version	Date	Author	Reason for change
V1.0	01.12.2024	JS	Initial



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