

DCX200-GaN — GaN LLC DC-DC Transformer

DCX200-GaN-Rx

Isolated, Unregulated DC-DC Transformer

Features & Benefits

- Isolated, unregulated LLC resonant converter
- Fixed-ratio DC transformer (DCX) operation
- Up to 200 W output power
- Input bus range: 21 – 37 V_{DC}
- Available in ratio 2, 3, and 4 variants
- Full GaN half-bridge with synchronous rectification
- Up to 98 % peak efficiency
- 130 W/in³ (8 W/cm³) power density
- Fixed-frequency operation at resonance (DCX mode)
 - Minimum switching losses (ZVS + ZCS)
 - Ultra-low EMI signature
- Soft-start & overcurrent protection
- OV, OC, UV, short circuit and thermal shutdown
- $\overline{\text{EN}}$ enable pin (active low) for electrical ON/OFF
- 1500 V_{DC} input-to-output isolation

Typical Applications

- 48 V bus intermediate conversion (IBC)
- Satellite & space power systems
- Telecom power distribution
- Data center 48 V to point-of-load
- Battery management systems
- Industrial & railway power

Product Ratings

$V_{\text{IN}} = 21 - 37 \text{ V}$	$P_{\text{OUT}} = 200 \text{ W}$
$V_{\text{OUT}} = V_{\text{IN}} / N$	$I_{\text{OUT}} \text{ up to } 30 \text{ A}$

Variant	R2	R3	R4
Turns ratio N	2:1	3:1	4:1
$V_{\text{OUT}} @ 28 \text{ V}_{\text{IN}}$	14 V	9.33 V	7 V
V_{OUT} range	10.5–18.5	7–12.3	5.25–9.25

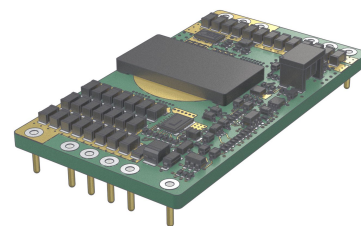
Product Description

The DCX200-GaN is a high-efficiency isolated DC-DC transformer based on an LLC resonant topology operating at its resonant frequency (DCX mode). Unlike regulated converters, the DCX200 acts as an isolated bus converter with a fixed voltage ratio, providing galvanic isolation with near-unity efficiency.

Built with EPC eGaN[®] FETs on both primary half-bridge and secondary synchronous rectifier, the converter achieves ZVS on the primary and ZCS on the secondary simultaneously, yielding peak efficiencies above 98 %. The ultra-compact 59 × 33 mm module is ideally suited for intermediate bus architectures.

Package Information

- Through-hole pin module package
 - 59 × 33 × 12.88 mm [2.323 × 1.299 × 0.507 in]
 - Weight: 40 g [1.41 oz]
- 12 through-hole pins on two rows
- Operating temp: –40 to +105 °C



Typical Application

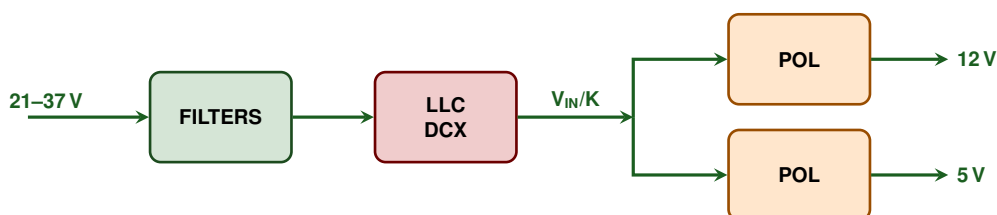


Figure 1 — Typical IBC architecture: input filter + DCX200-GaN LLC transformer + downstream POL regulators



Pin Configuration

Pin	Signal Name	Type	Function
1	V _{IN}	INPUT POWER	Positive input power terminal
2	TM _{TH}	OUTPUT	Thermal monitor output
3	I _{SET}	INPUT	Output current limit adjustment
4	I _{BUF}	OUTPUT	Buffered output current monitor
5	$\overline{\text{EN}}$	INPUT	Enable pin, active low. ON (low), OFF (open/high)
6	0V _P	INPUT RETURN	Primary-side 0 V (input power return)
7, 8, 9	0V _S	OUTPUT RETURN	Secondary-side 0 V (output power return, internally paralleled)
10, 11, 12	V _{OUT}	OUTPUT POWER	Positive output power terminal (internally paralleled)

Pin numbering per the recommended land pattern (Section: Recommended Land Pattern, page 5): pins 1–6 on the control/input row, left to right; pins 7–12 on the output row, right to left (counter-clockwise numbering), module viewed from the top side.

Absolute Maximum Ratings

The absolute maximum ratings below are stress ratings only. Operation at or beyond these maximum ratings can cause permanent damage to the device. Electrical specifications do not apply when operating beyond rated operating conditions.

Parameter	Comments	Min	Max	Unit
Input Voltage (+IN to IN RTN)		–0.5	45	V
Output Power			200	W
Operating Temperature Range	T-Grade	–40	+105	°C
Storage Temperature		–55	+125	°C
Lead Temperature (soldering)	10 s max		300	°C
Dielectric Withstand (IN to OUT)	Basic insulation		1500	V _{DC}
Average Output Current			30	A

Part Ordering Information

Part Number	Ratio	V _{OUT} @28V	Temperature Grade
DCX200-GaN-R2T	2:1	14.0 V	T = –40 to +105 °C
DCX200-GaN-R3T	3:1	9.33 V	T = –40 to +105 °C
DCX200-GaN-R4T	4:1	7.0 V	T = –40 to +105 °C

Safety, Reliability and Isolation

Parameter	Comments	Min	Typ	Max	Unit
Dielectric Withstand	IN to OUT	1500			V _{DC}
	IN to CASE	500			V _{DC}
Insulation Resistance	IN to OUT @500V, 1 min	100			MΩ
MTBF	MIL-HDBK-217F, 25 °C		1.5		MHrs



Electrical Specifications

Specifications apply over the full input range, $T_{CASE} = 25^{\circ}\text{C}$, unless otherwise noted. **Boldface** specifications apply over the full temperature range. Specifications shown for ratio 4:1 variant (DCX200-GaN-R4T); other ratios scale V_{OUT} accordingly.

Attribute	Conditions / Notes	Min	Typ	Max	Unit
Power Input Specifications					
Input Voltage Range	Continuous operation	21	28	37	V
Inrush Current (Peak)	Full resistive load			10.0	A
Input Current (no load)	$\overline{\text{EN}}$ low (enabled)		20	40	mA
Input Current (disabled)	$\overline{\text{EN}}$ high or open		2	5	mA
Power Output Specifications					
Output Voltage (R4, @28V)	$V_{IN} / 4$, no regulation		7.0		V
Output Voltage Range (R4)	Over input range	5.25	—	9.25	V
Rated Output Power	Continuous			200	W
Rated Output Current (R4)	@ $V_{OUT} = 7\text{ V}$			28.6	A
Output Current Limit	Of rated $I_{OUT\text{ max}}$	110	130	150	%
Efficiency (R4 variant, $V_{IN} = 28\text{ V}$)					
Efficiency @100 % load		96.5	97.5		%
Efficiency @50 % load		97.0	98.0		%
Efficiency @25 % load		96.0	97.5		%
Peak efficiency	Over load range		98.0		%
Output Voltage Characteristics					
Voltage Ratio Accuracy	At nominal V_{IN} , 100 % load	−1.0		+1.0	%
Output Ripple (R4, @28V)	BW 20 MHz, 100 % load		30	80	mV _{pp}
Load Regulation	Unregulated (DCX mode)				
	Resistive drop only		1.5	3.0	%
Dynamic Specifications					
Switching Frequency	Fixed at resonance (DCX)	450	500	550	kHz
Turn-on Delay	From $\overline{\text{EN}}$ falling edge	0.5		5	ms
Turn-off Delay	From $\overline{\text{EN}}$ rising edge			500	μs
Soft Start Ramp Time	Full rated resistive load		5	15	ms
Control Pins					
$\overline{\text{EN}}$ ON Threshold	Logic low			1.2	V
$\overline{\text{EN}}$ OFF Threshold	Logic high or open	3.3			V
FT Voltage (fault active)			3.0		V
FT drive capability				4	mA
Powertrain Protections					
Input UVLO Threshold		18		20	V
Input UVLO Recovery			21		V
Input OVLO Threshold				40	V
Input OVLO Recovery			37		V
Overtemperature (internal)				115	°C
Short Circuit Response				200	μs
Power Limit				260	W



Mechanical Specifications

Parameter	Value	Unit
Overall Dimensions (L × W × H, pins included)	59.00 × 33.00 × 12.88	mm
	2.323 × 1.299 × 0.507	in
Module thickness (pins excluded)	10.3	mm
PCB thickness	2.44	mm
Tallest component above board	5.42	mm
Lowest component below board (pins excluded)	2.4	mm
Pin protrusion below board	5.02	mm
Mass	40	g
Mounting	Through-hole pins	—
Pin count	12	—
Pin material	Gold over nickel	—

Package Drawings

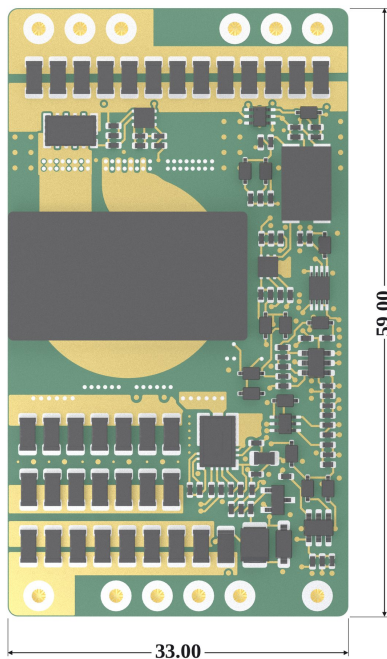


Figure 2 — Top view

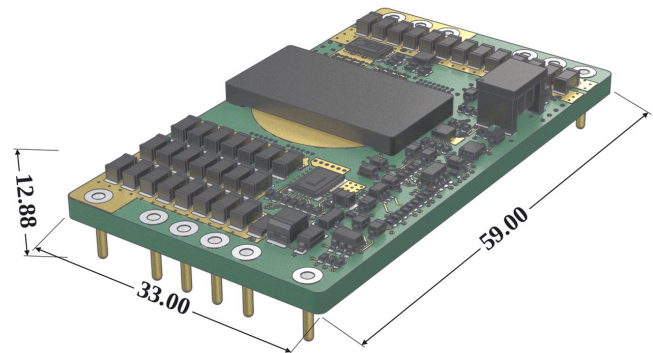


Figure 3 — Isometric view

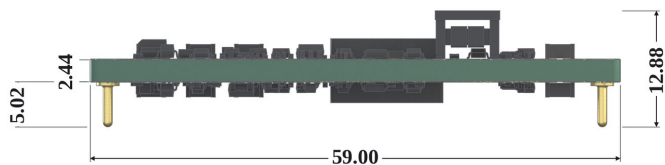


Figure 4 — Side view

All dimensions in mm. Dimensions measured on the 3D CAD model (STEP).

Recommended Land Pattern

Recommended PCB land pattern, viewed from the **top (component) side**. The module mounts with 12 through-hole pins on two rows spaced 55.0 mm apart. Pin 1 (V_{IN}) is identified by the corner index mark. All dimensions in mm; geometry per mechanical drawing V3.

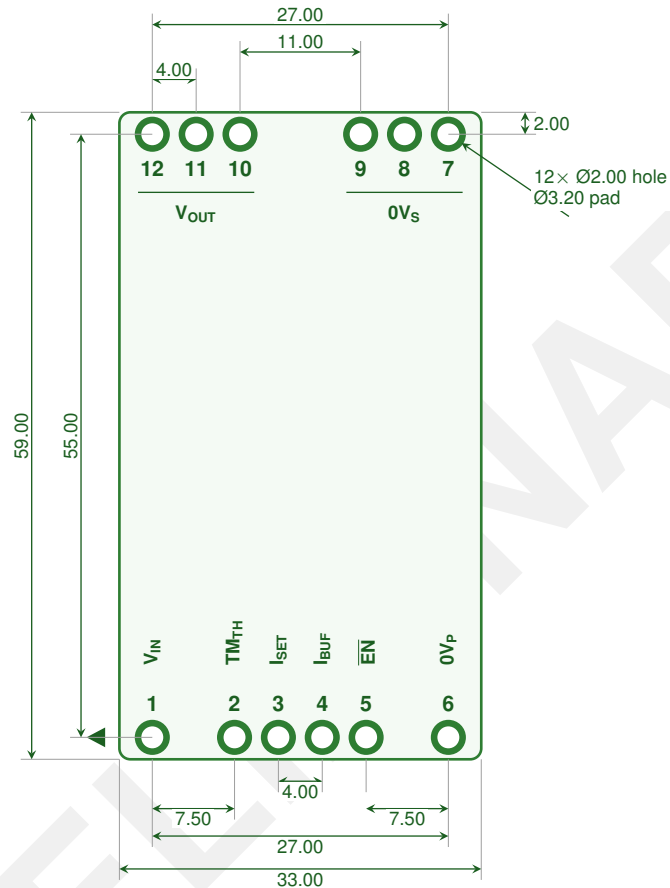


Figure 5 — Recommended land pattern (top view, component side). Corner radius 1.0 mm.

Parameter	Value	Note
Hole diameter	2.00 mm	12 positions, plated through-hole
Recommended pad diameter	3.20 mm	Annular ring ≥ 0.6 mm
Row spacing (pad centers)	55.00 mm	Output row to control/input row
Pad row to board edge of module	2.00 mm	Both rows
Copper pour under module	Keep-out on inner layers under isolation barrier	Maintain primary–secondary clearance/creepage