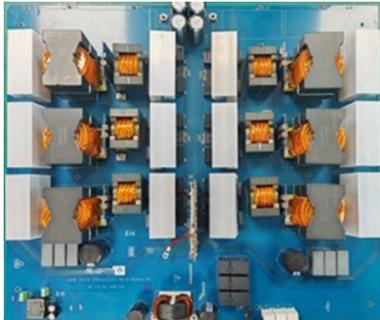


60 kW two-channel three-phase LLC with synchronous rectification with digital controller



Fully assembled board developed for performance evaluation only, [not available for sale](#)

Features

- DC-DC power converter with two-channel three-phase LLC topology
- DC input range: DC voltage 650 to 850 V dc
- DC output range: DC voltage 250 to 1000 V dc
- Maximum power: 60 kW
- Maximum current: 200 A
- Peak efficiency > 98.52%
- High switching frequency operation (90 ~ 280 kHz)
- < 1% output voltage ripple
- PFM and phase-shift hybrid control for soft startup and voltage ripple optimize

Description

The [STDES-60KWLLCWR](#) introduces a complete ST's digital power solution for high-power DC-DC applications based on the two-channel three-phase LLC topology, mostly used for electric vehicle (EV) DC fast charging applications and industrial high-power switch mode power supply (SMPS) applications.

This platform achieves larger than 98.52% peak efficiency by utilizing 1200 V, 27mohm SiC MOSFETs [SCT025W120G3-4AG](#), and 900 V, 12mohm SiC MOSFETs [SCT012W90G3-4AG](#).

The [STDES-60KWLLCWR](#) features fully digital control, with the [STM32G474VE](#) mixed-signal high-performance microcontroller providing the full control of the DC voltage and current, with accurate protection by utilize on-chip comparators.

The usage of pulse frequency modulation (PFM) and phase-shift hybrid control method ensures high precision voltage and current output.

Product summary	
60 kW two-channel three-phase LLC with synchronous rectification with digital controller	STDES-60KWLLCWR
Automotive-grade silicon carbide Power MOSFET 1200 V, 27 mOhm typ., 56 A in an HiP247-4 package	SCT025W120G3-4AG
Automotive-grade silicon carbide Power MOSFET 900 V, 12 mOhm typ., 110 A in an HiP247-4 package	SCT012W90G3-4AG
Mainstream Arm Cortex-M4 MCU 170 MHz with 512 Kbytes of Flash memory	STM32G474VET6
Galvanically isolated 4 A single gate driver for SiC MOSFETs	STGAP2SICS
Applications	EV charging - AC and DC wallbox charger

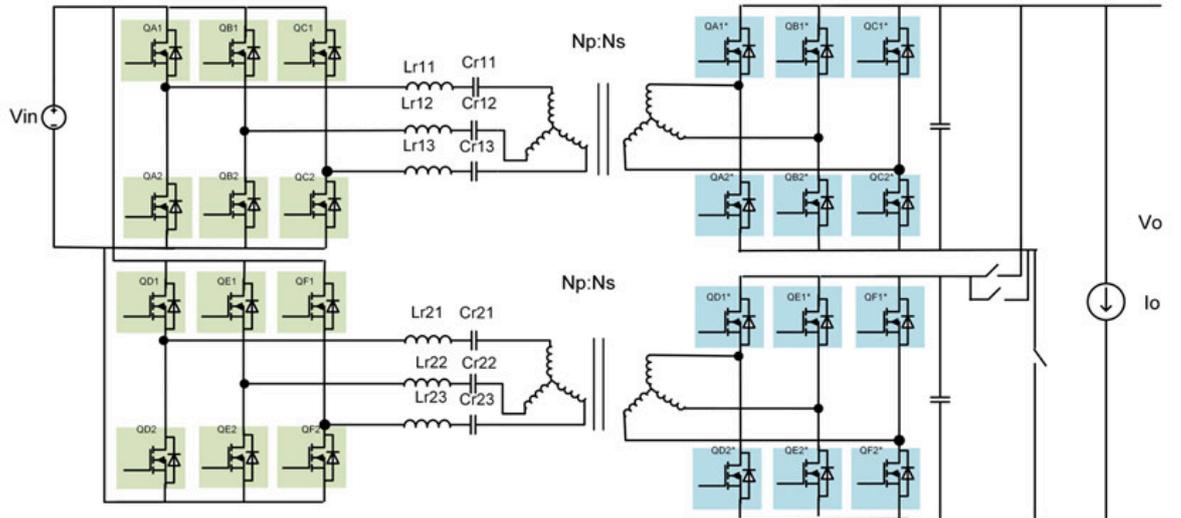
1 Electrical specifications

Table 1. Electrical characteristics

Symbol	Description	Min.	Typ	Max.	Units	Comments
V _{in}	Input DC Voltage	650	800	850	V	
V _{out}	Output DC Voltage	250	350/700	1000	V	
P _{out}	Output Power			60	kW	
I _{out}	Output Current			200	A	V _{out} =300V
η	Peak Efficiency			98.52	%	V _{in} =840V, V _{out} =700V
V _{ripple}	Max Voltage Ripple			1	%	V _{out} >300V no burst mode
				3	V	V _{out} <300V no burst mode
V _{out}	Load Regulation			1	%	5%~ 100% load
V _{out}	Dynamic Regulation			5	%	25%-50%-75% load dynamic (V _o :250V,300V,700V,800V, 1000V)
V _{out_UVP}	Output under Voltage Protection			V _{ref} -60	V	
V _{out_OVP}	Output over Voltage Protection			120%*V _{ref}	V	
I _{pri_OCP}	Resonate Tank Over Current Protection			60	A	

2 Platform overview

Figure 1. System architecture of 2-ch 3ph LLC converter with synchronous rectification



3 Schematic diagrams

Figure 2. STDES-60KWLLCWR - Control board circuit schematic - (1 of 4)

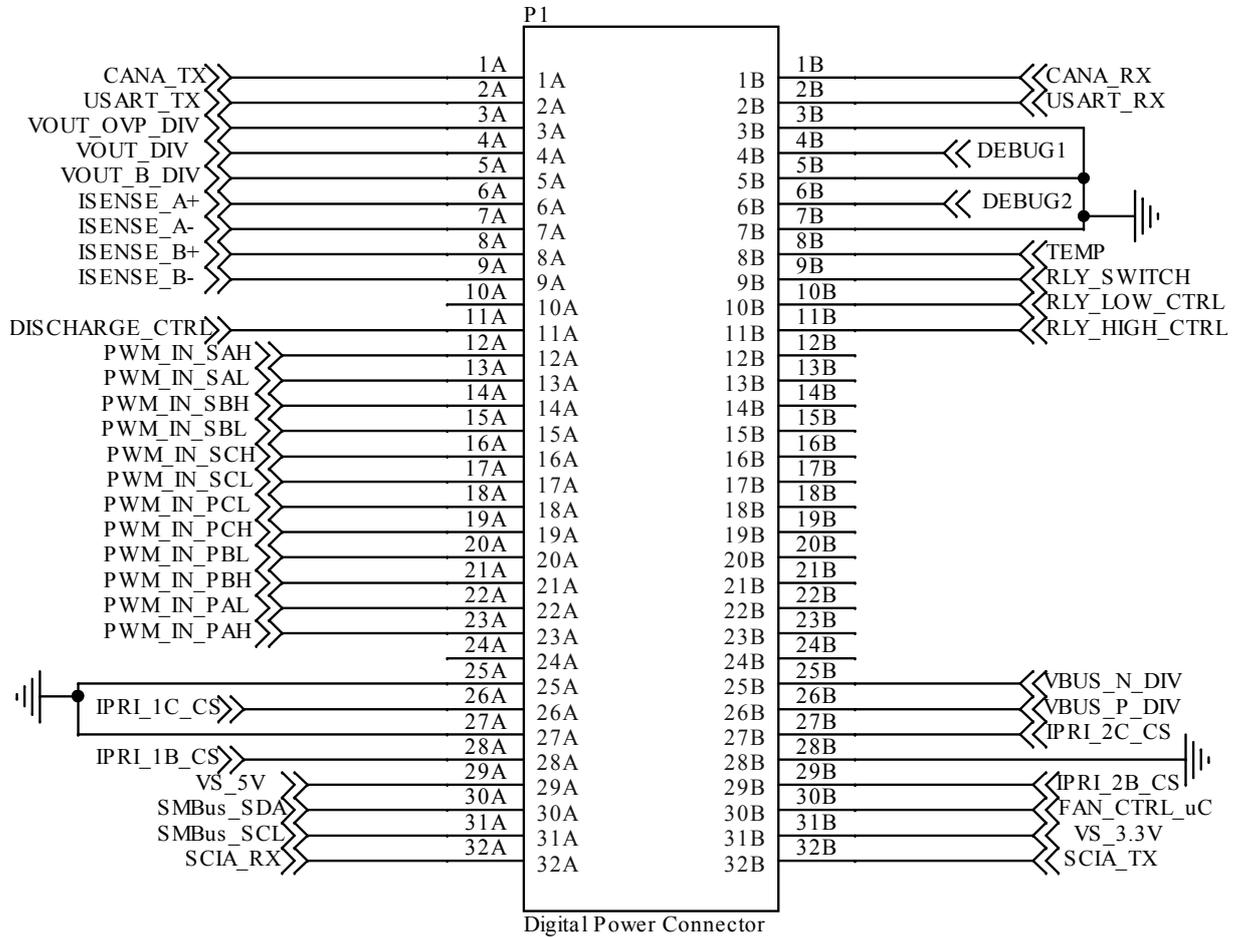


Figure 4. STDES-60KWLLCWR - Control board circuit schematic - (3 of 4)

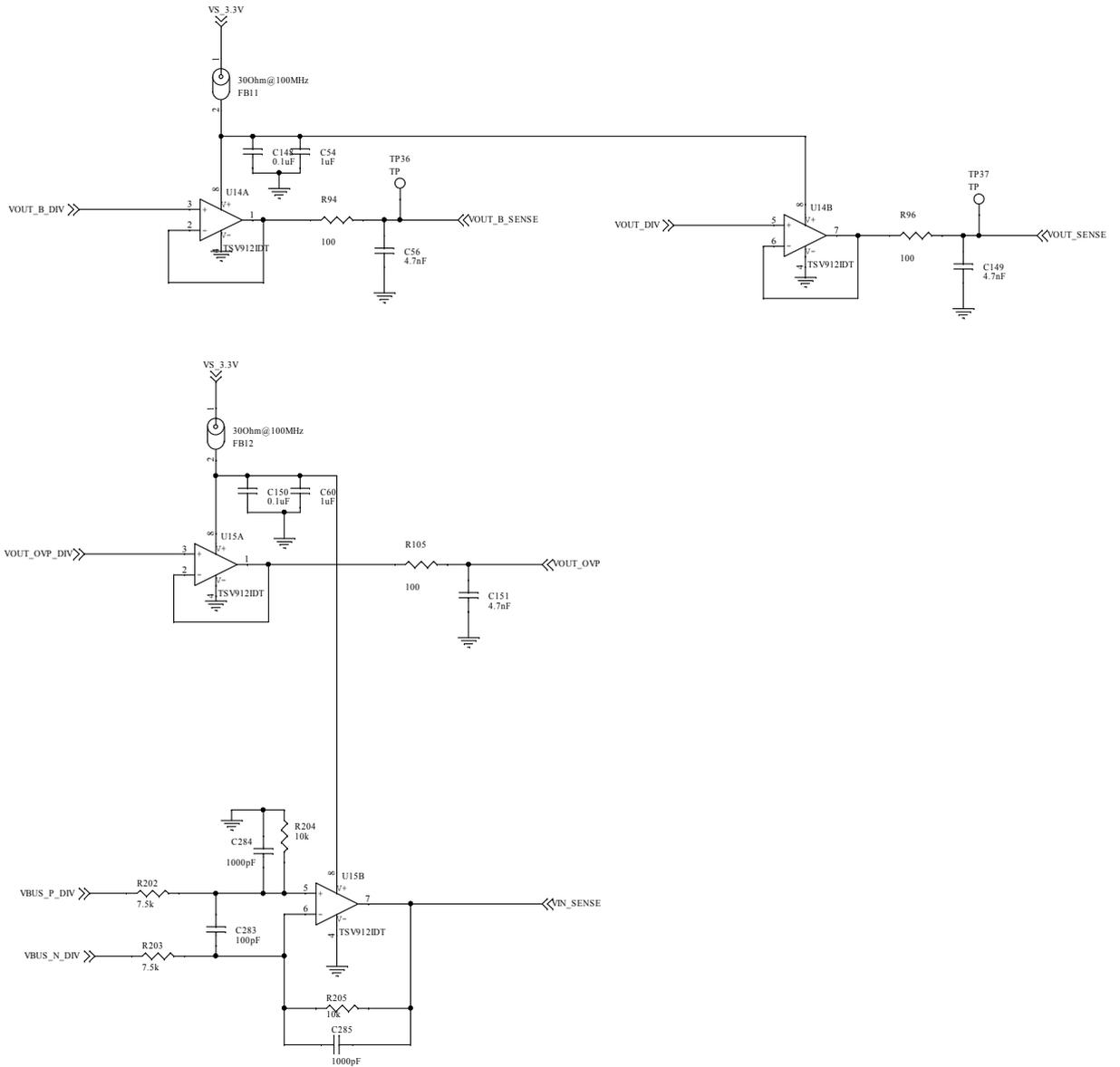


Figure 5. STDES-60KWLLCWR - Control board circuit schematic - (4 of 4)

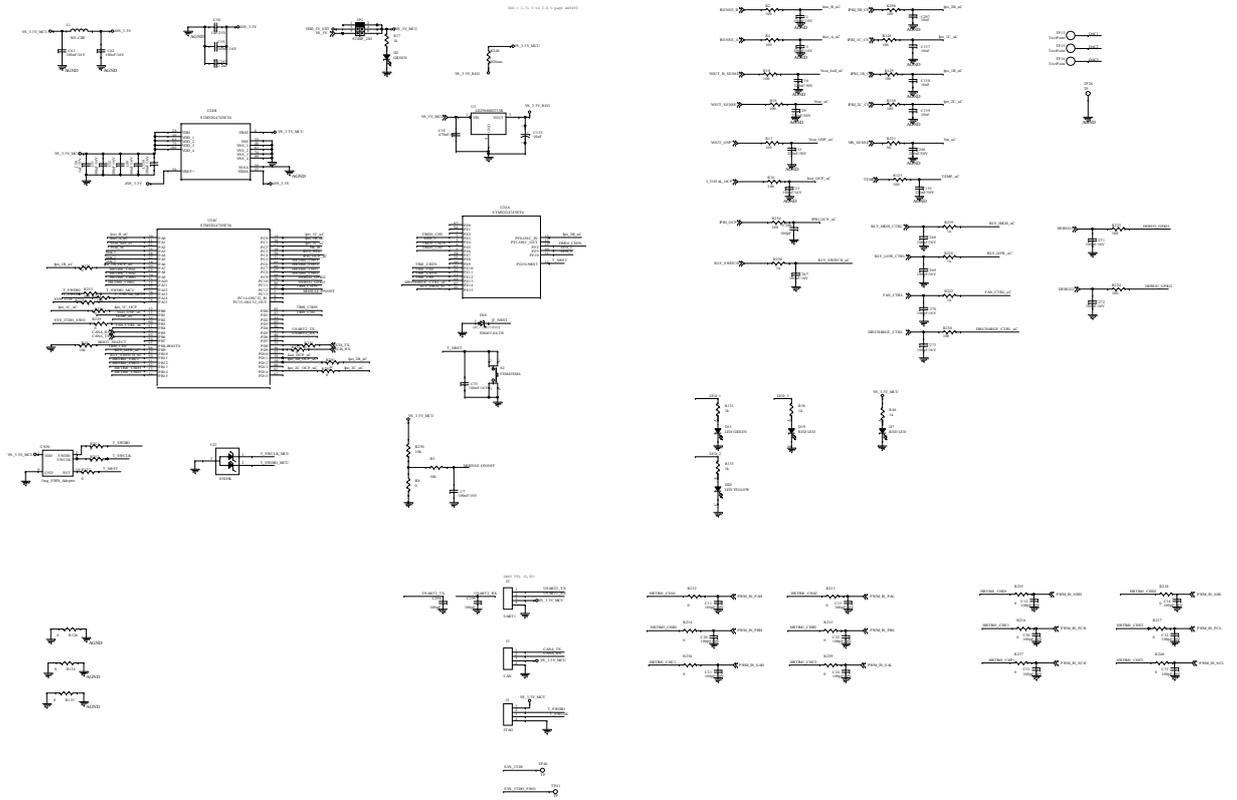


Figure 6. STDES-60KWLLCWRP - Power board circuit schematic - (1 of 9)

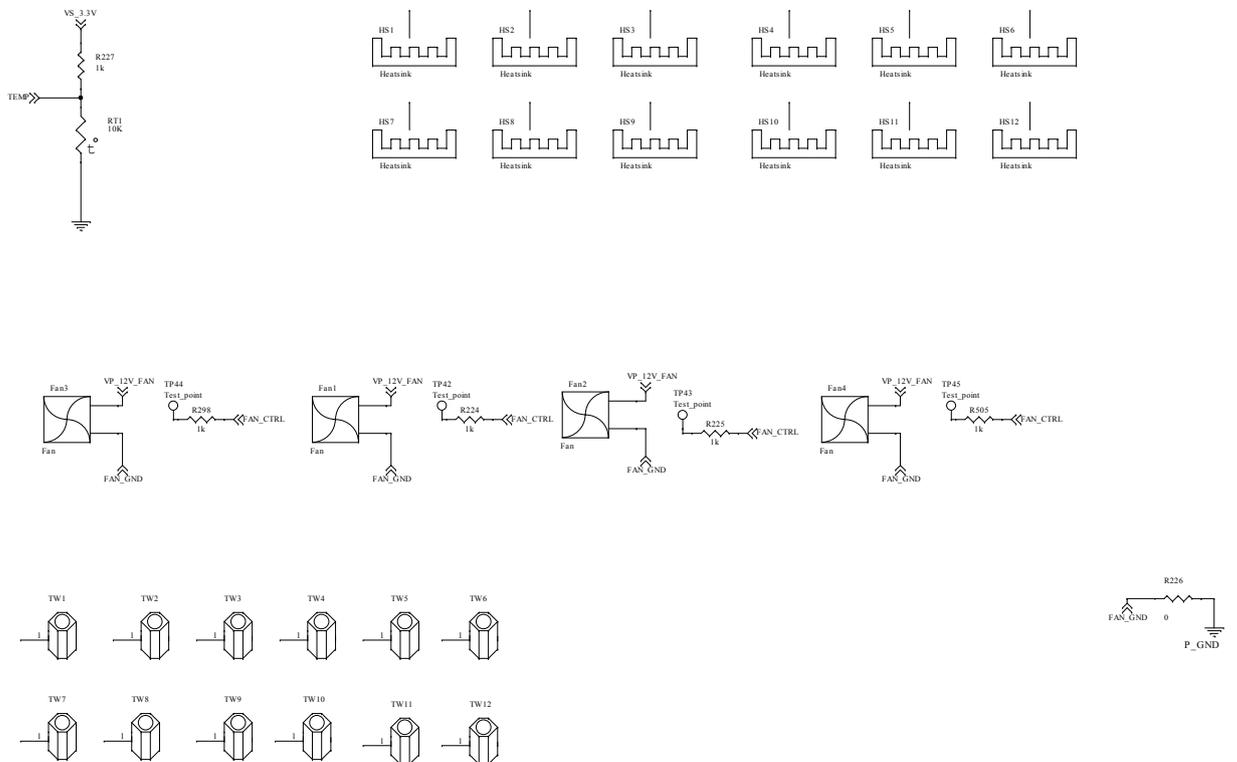


Figure 7. STDES-60KWLLCWRP - Power board circuit schematic - (2 of 9)

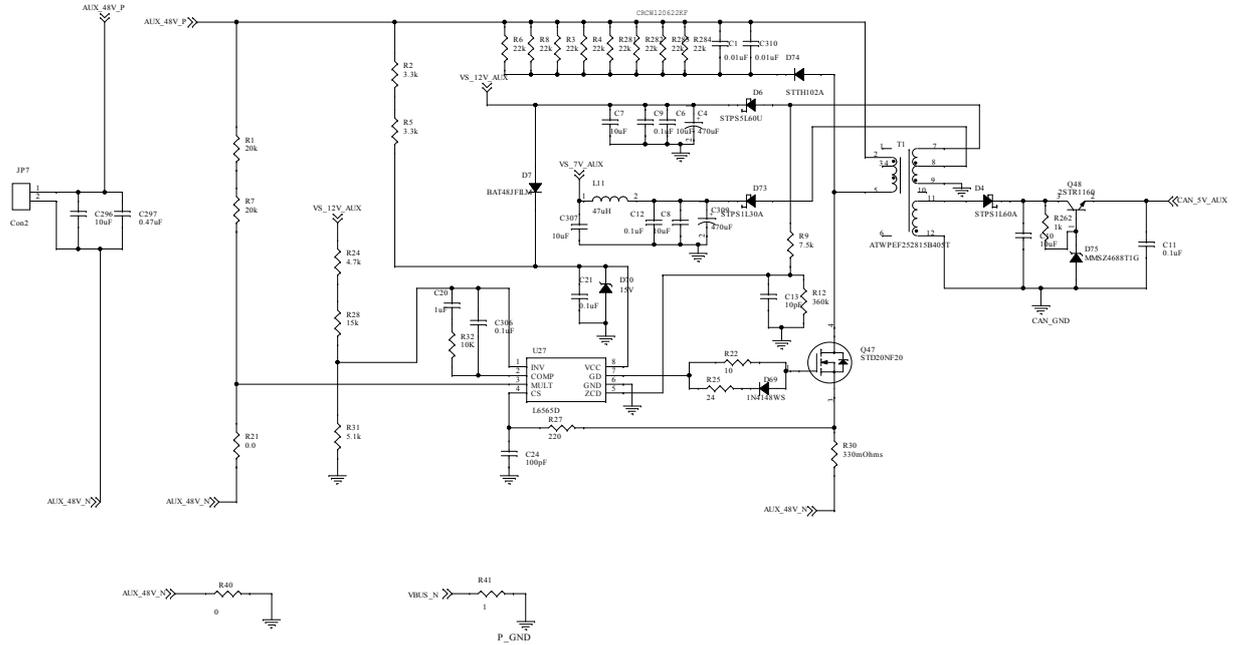


Figure 8. STDES-60KWLLCWRP - Power board circuit schematic - (3 of 9)

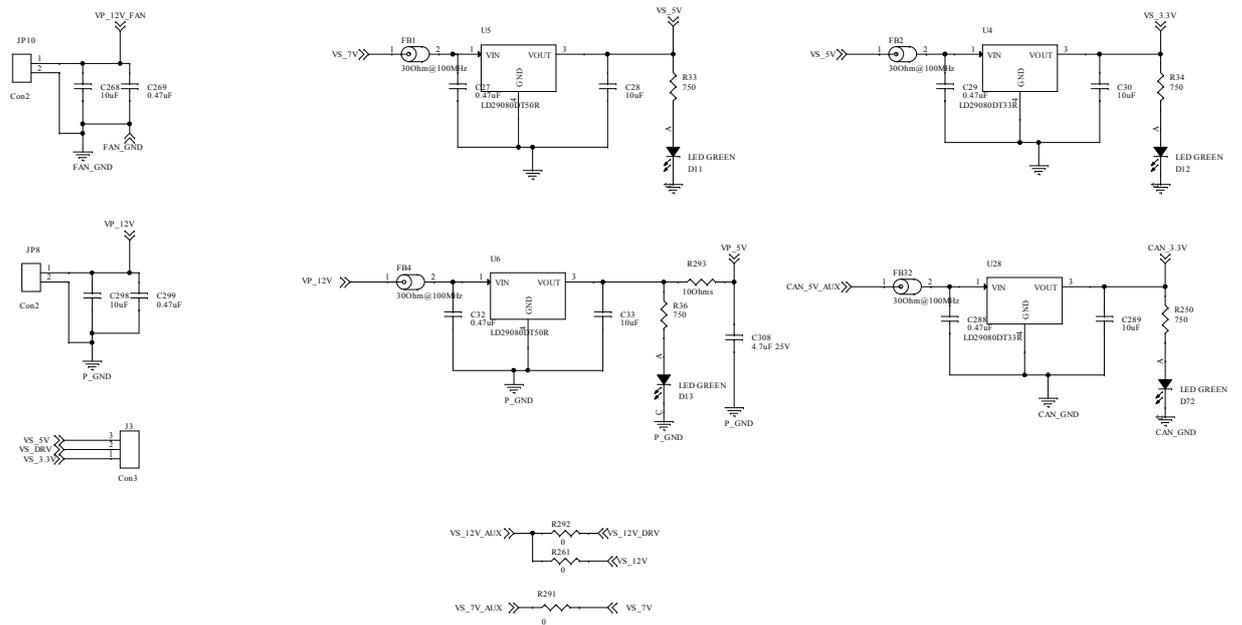


Figure 9. STDES-60KWLLCWRP - Power board circuit schematic - (4 of 9)

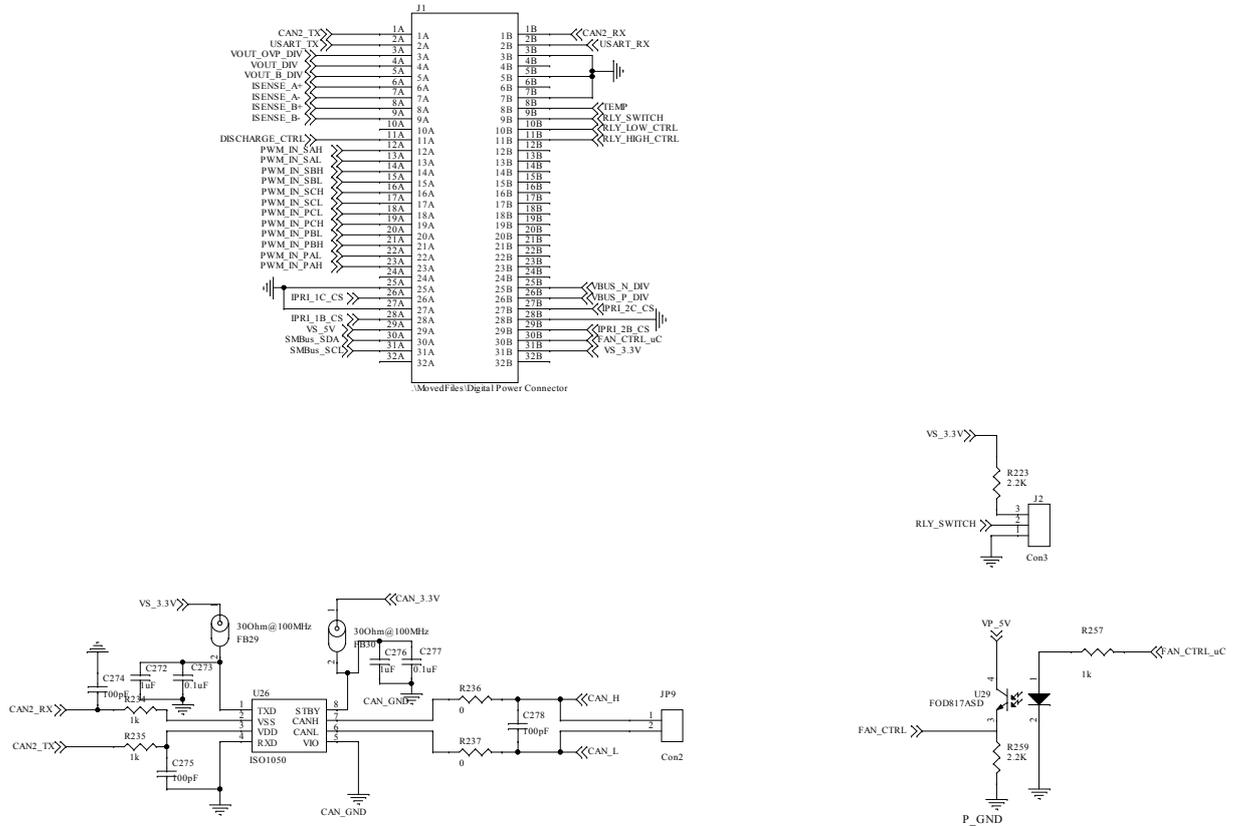


Figure 10. STDES-60KWLLCWRP - Power board circuit schematic - (5 of 9)

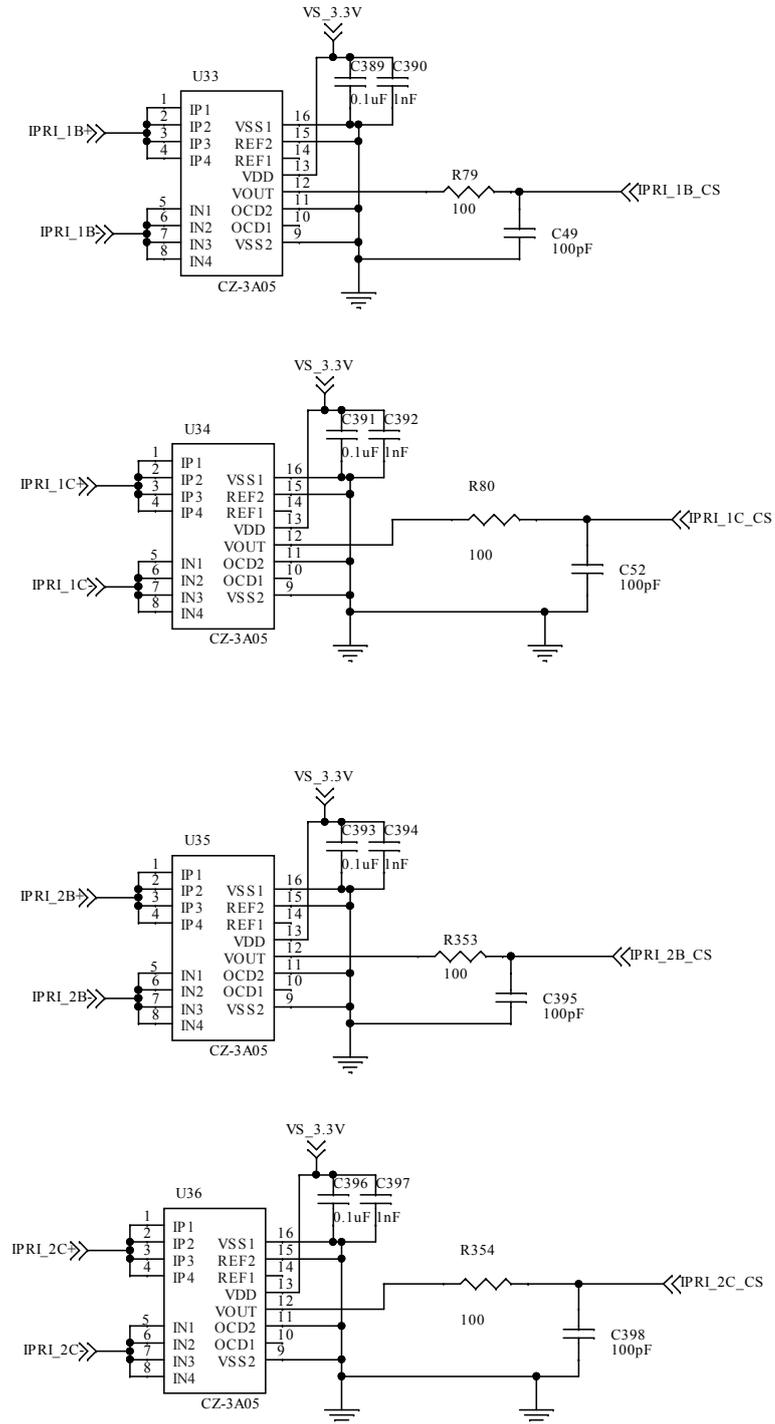


Figure 11. STDES-60KWLLCWRP - Power board circuit schematic - (6 of 9)

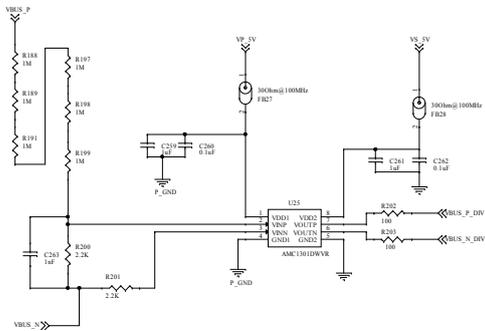
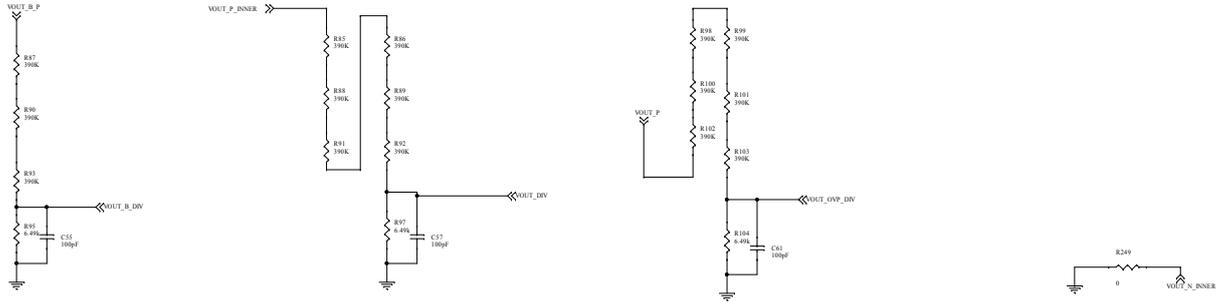


Figure 12. STDES-60KWLLCWRP - Power board circuit schematic - (7 of 9)

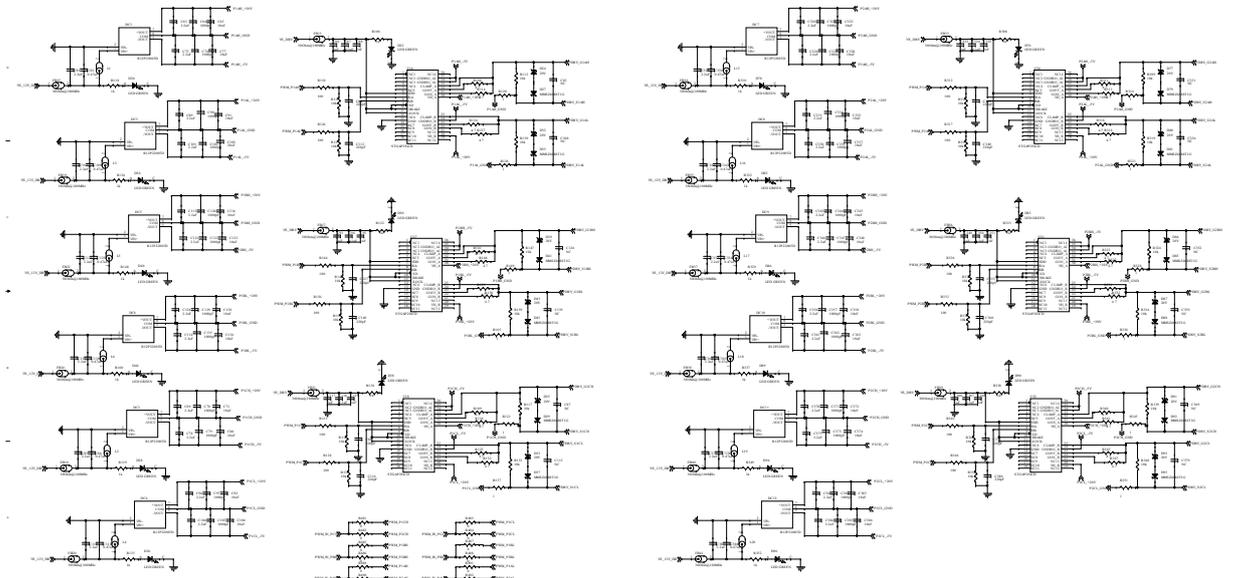


Figure 13. STDES-60KWLLCWRP - Power board circuit schematic - (8 of 9)

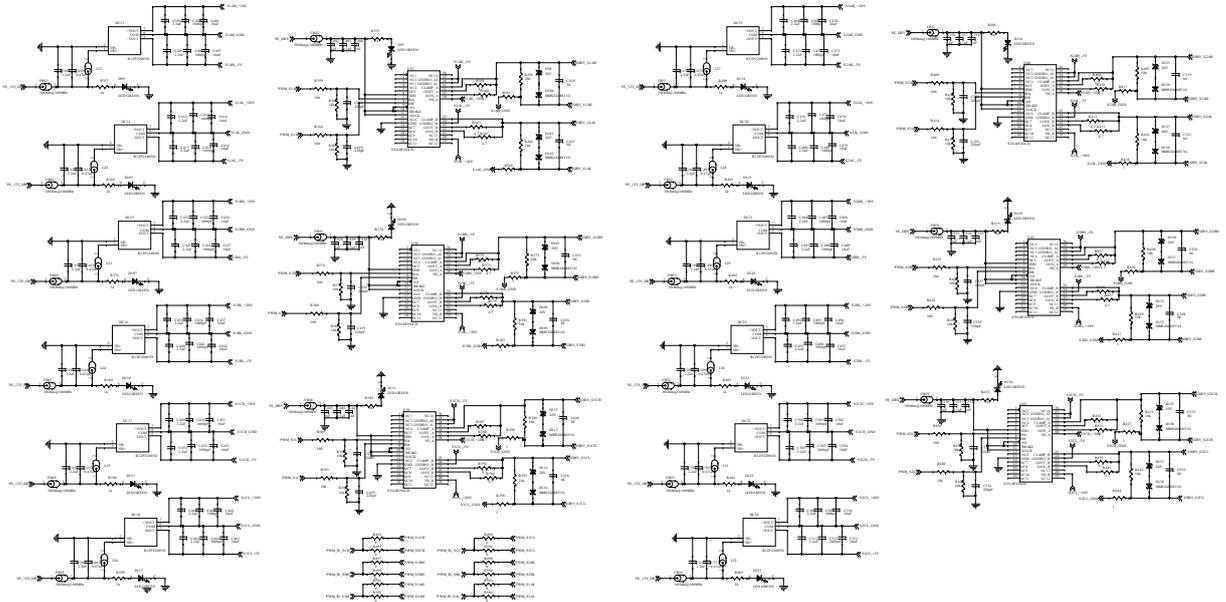


Figure 14. STDES-60KWLLCWRP - Power board circuit schematic - (9 of 9)

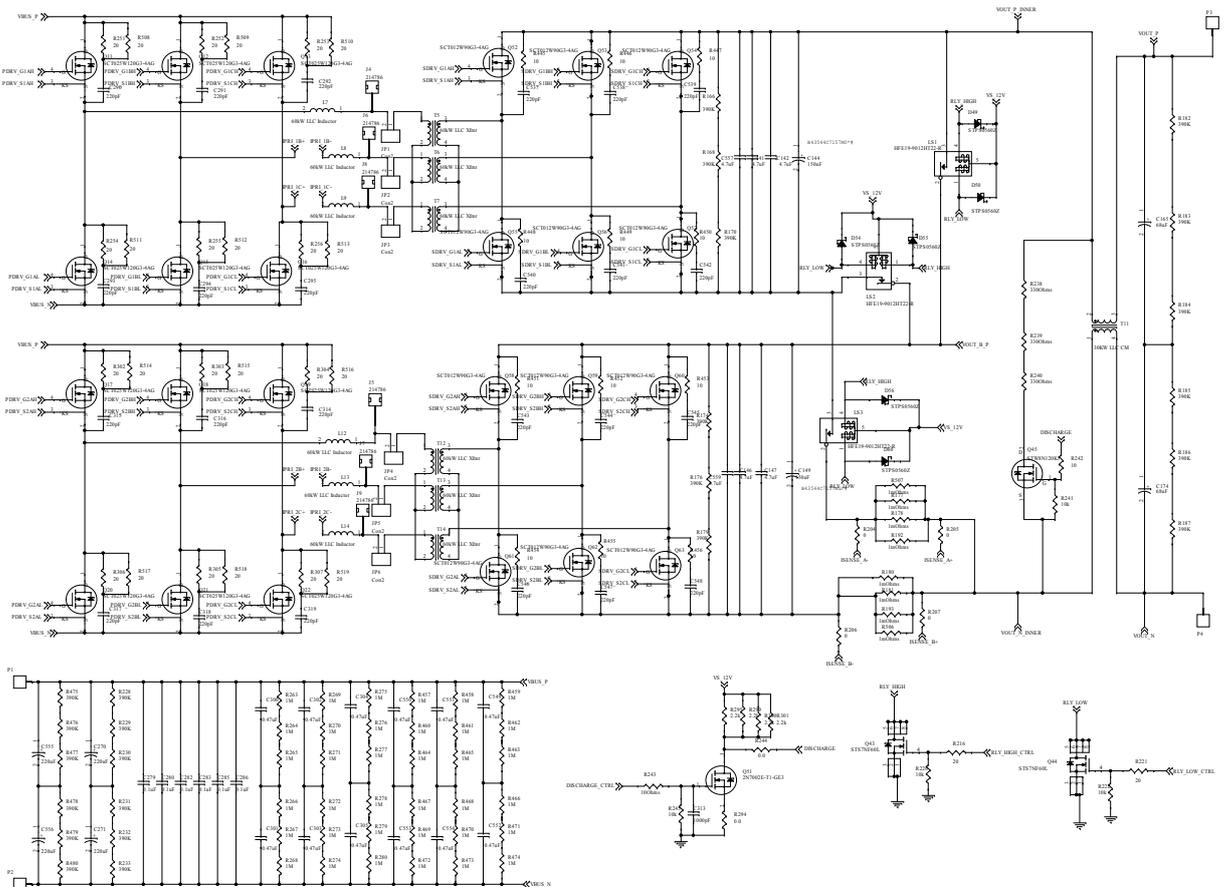
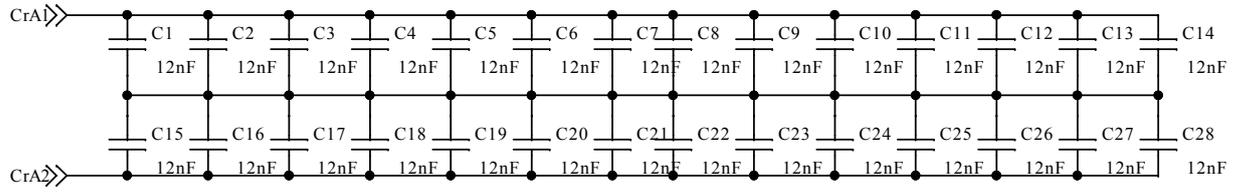


Figure 15. STDES-60KWLLCWRR - Resonant capacitors board circuit schematic



Revision history

Table 2. Document revision history

Date	Revision	Changes
26-Feb-2026	1	Initial release.

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