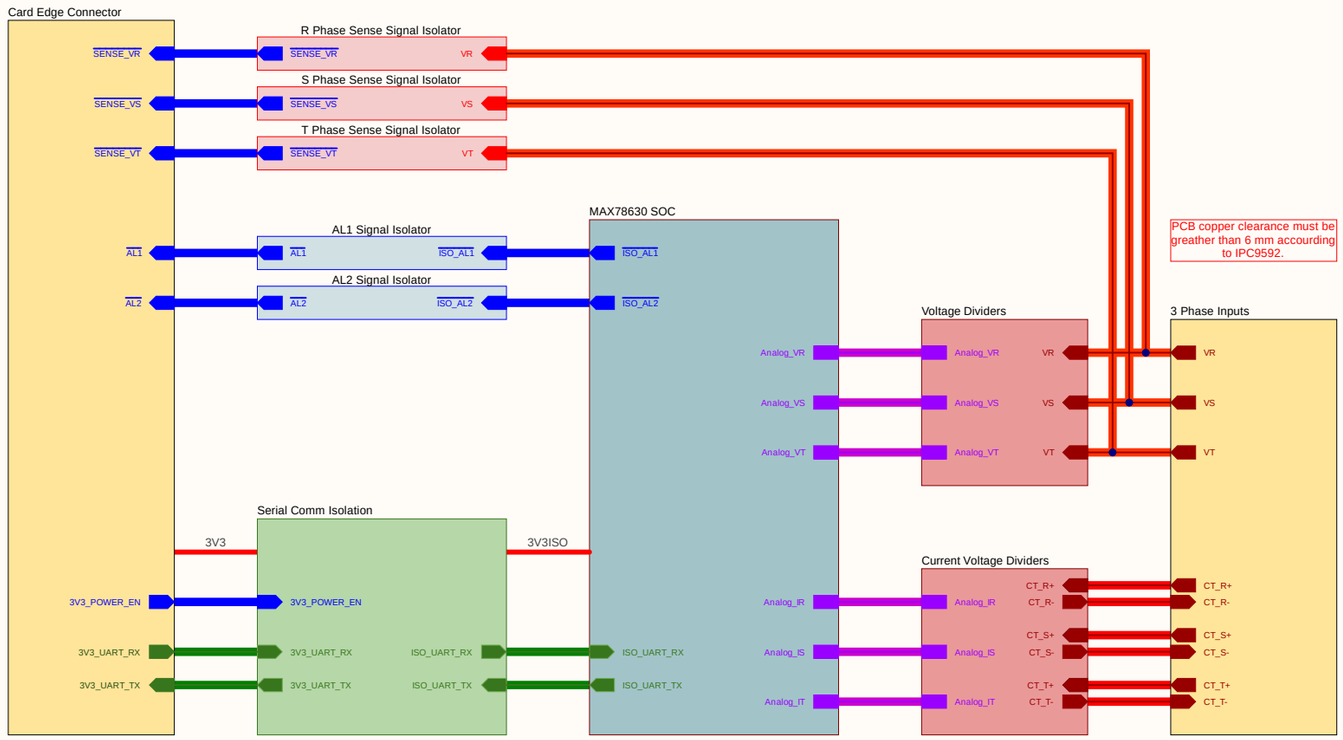


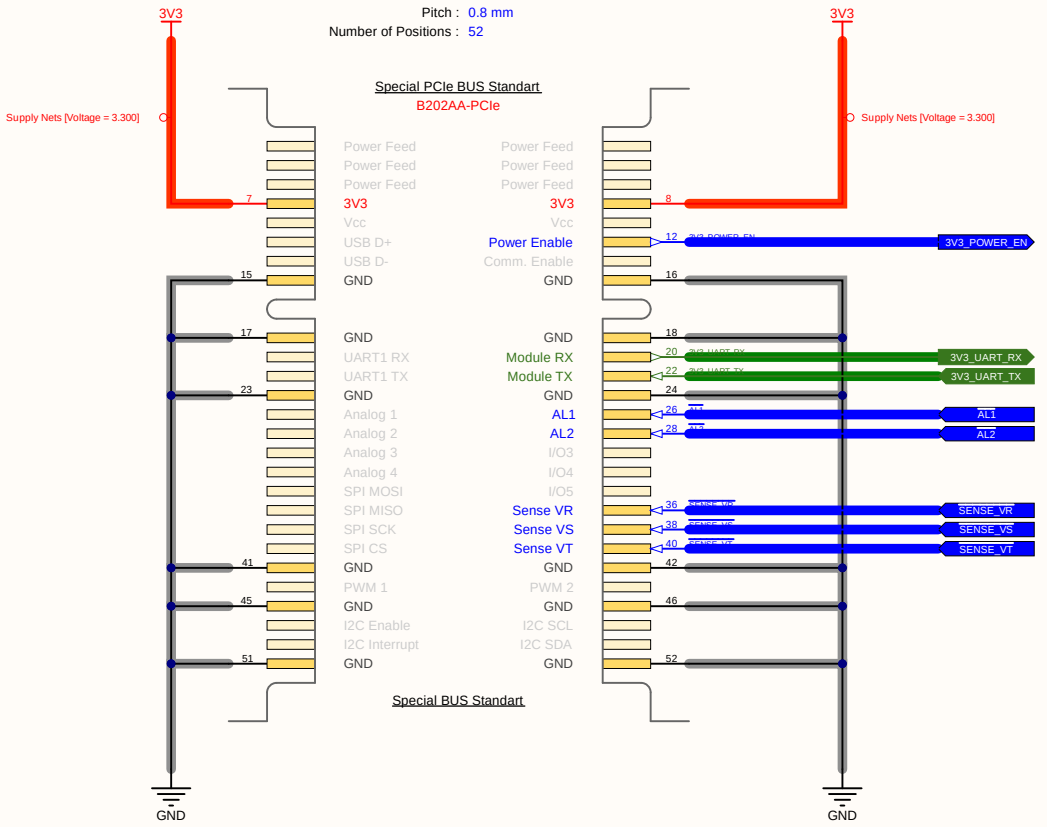
www.github.com/akkoyun/B202AA-PCIe

B202AA Block Diagram		Engineer : Gunce Akkoyun	-
		Customer : -	
Size : A4	Project : PollyPhase Energy Analyzer	Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB
		Module ID : B202AA-PCIe	103. Cad. No : 12
Date : 7.11.2025	Time : 15:54:17 Page : 1 / 12	Version : R1	Selcuklu / Konya Türkiye
File : Block Diagram.SchDoc		Revision : 00.00.01	

J1

Bus Type : Mini PCI Express
Mating Connector : TE 2041262-1
Pitch : 0.8 mm
Number of Positions : 52

Special PCIe BUS Standart
B202AA-PCIe



Special PCIe BUS Standart

Special BUS Standart

www.github.com/akkoyun/B202AA-PCIe

Card Edge Connector			Engineer : Gunce Akkoyun	-	
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB	stf
			Module ID : B202AA-PCIe	103. Cad. No : 12	
Date : 7.11.2025	Time : 15:54:17	Page : 2 / 12	Version : R1	Selcuklu / Konya Türkiye	
File : Card Edge Connecgtor.SchDoc			Revision : 00.00.01		

Nominal: 230 Vac (phase–neutral)
Worst-case: 400 Vac (phase–phase)

Total resistance: 720 kΩ (4 × 180 kΩ / 0.5 W – 0805)

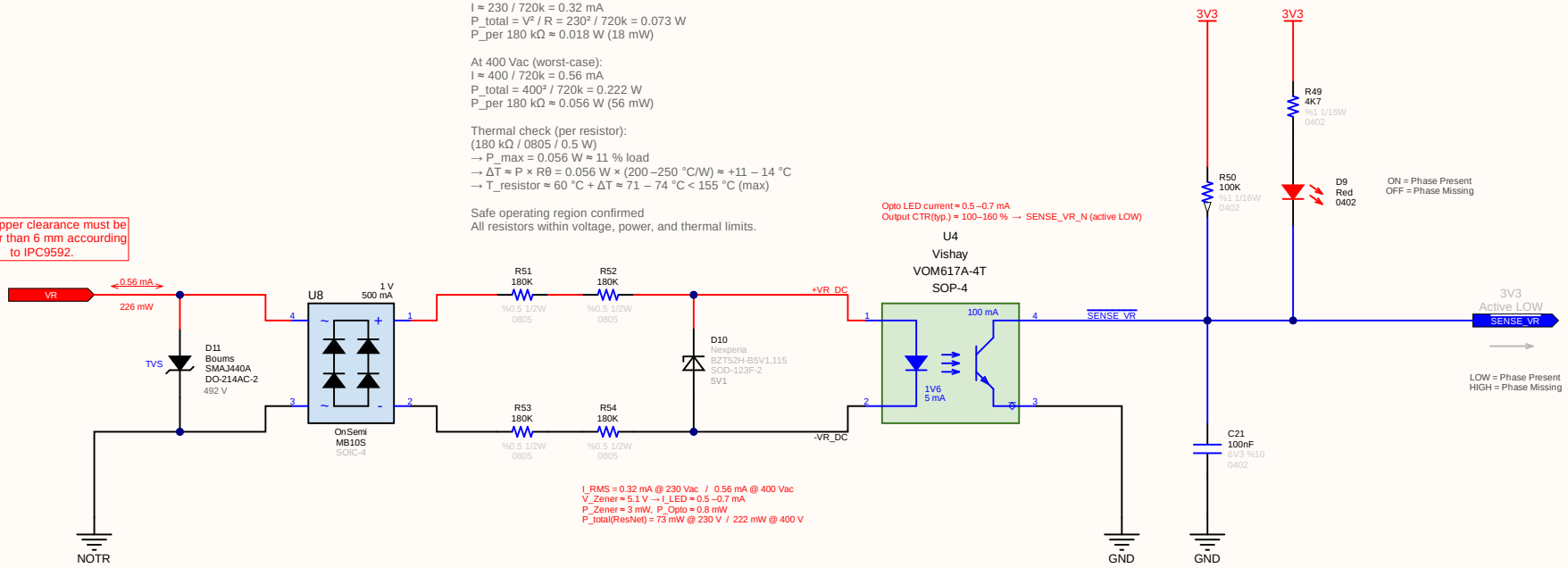
At 230 Vac:
I ≈ 230 / 720k = 0.32 mA
P_total = V² / R = 230² / 720k = 0.073 W
P_per 180 kΩ ≈ 0.018 W (18 mW)

At 400 Vac (worst-case):
I ≈ 400 / 720k = 0.56 mA
P_total = 400² / 720k = 0.222 W
P_per 180 kΩ ≈ 0.056 W (56 mW)

Thermal check (per resistor):
(180 kΩ / 0805 / 0.5 W)
→ P_max = 0.056 W ≈ 11 % load
→ ΔT ≈ P × Rθ = 0.056 W × (200–250 °C/W) ≈ +11 – 14 °C
→ T_resistor ≈ 60 °C + ΔT ≈ 71 – 74 °C < 155 °C (max)

Safe operating region confirmed
All resistors within voltage, power, and thermal limits.

PCB copper clearance must be greather than 6 mm accourding to IPC9592.



www.github.com/akkoyun/B202AA-PCIe

R Phase Sense Signal Isolation			Engineer : Gunce Akkoyun	-	stf
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB 103. Cad. No : 12 Selcuklu / Konya Türkiye	
Date : 7.11.2025	Time : 15:54:17	Page : 3 / 12	Module ID : B202AA-PCIe		
File : R Phase Sense Signal Isolation.SchDoc			Version : R1		
			Revision : 00.00.01		

Nominal: 230 Vac (phase–neutral)
Worst-case: 400 Vac (phase–phase)

Total resistance: 720 kΩ (4 × 180 kΩ / 0.5 W – 0805)

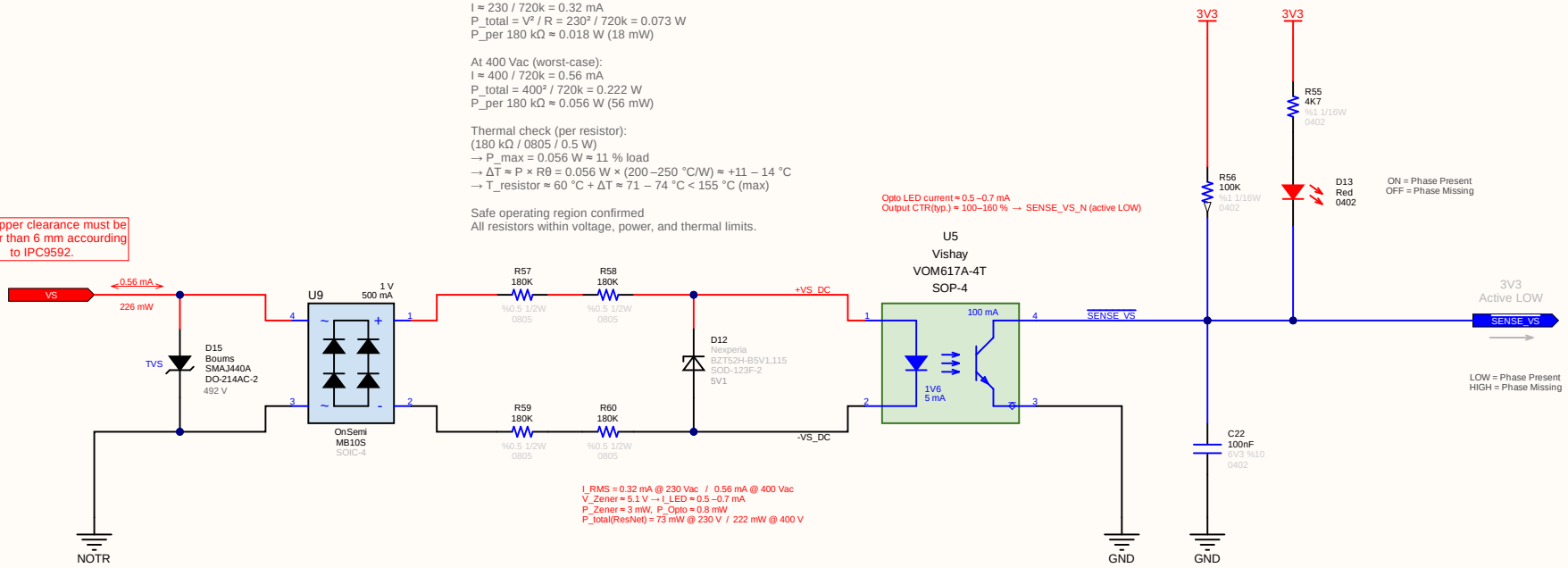
At 230 Vac:
I ≈ 230 / 720k = 0.32 mA
P_total = V² / R = 230² / 720k = 0.073 W
P_per 180 kΩ ≈ 0.018 W (18 mW)

At 400 Vac (worst-case):
I ≈ 400 / 720k = 0.56 mA
P_total = 400² / 720k = 0.222 W
P_per 180 kΩ ≈ 0.056 W (56 mW)

Thermal check (per resistor):
(180 kΩ / 0805 / 0.5 W)
→ P_max = 0.056 W ≈ 11 % load
→ ΔT ≈ P × Rθ = 0.056 W × (200–250 °C/W) ≈ +11 – 14 °C
→ T_resistor ≈ 60 °C + ΔT ≈ 71 – 74 °C < 155 °C (max)

Safe operating region confirmed
All resistors within voltage, power, and thermal limits.

PCB copper clearance must be greather than 6 mm accourding to IPC9592.



www.github.com/akkoyun/B202AA-PCIe

S Phase Sense Signal Isolation			Engineer : Gunce Akkoyun	-	
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB	stf
Date : 7.11.2025	Time : 15:54:17	Page : 4 / 12	Module ID : B202AA-PCIe	103. Cad. No : 12	
File : S Phase Sense Signal Isolation.SchDoc			Version : R1	Selcuklu / Konya Türkiye	
			Revision : 00.00.01		

Nominal: 230 Vac (phase–neutral)
Worst-case: 400 Vac (phase–phase)

Total resistance: 720 kΩ (4 × 180 kΩ / 0.5 W – 0805)

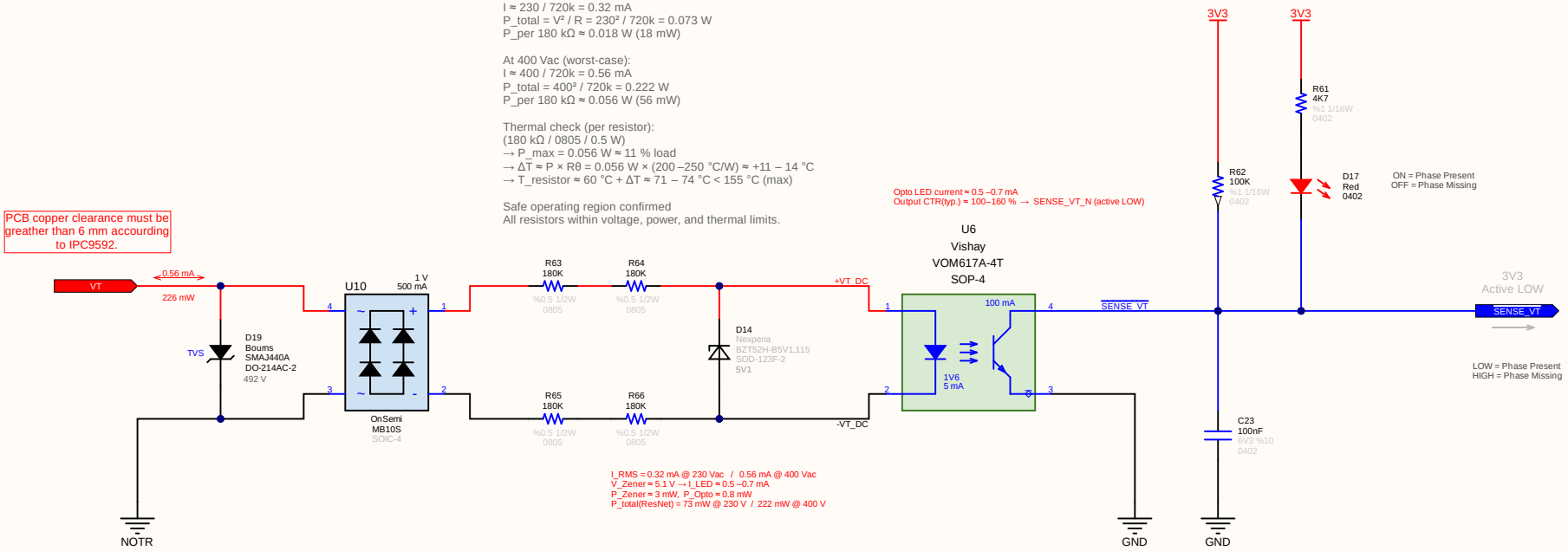
At 230 Vac:
I ≈ 230 / 720k = 0.32 mA
P_total = V² / R = 230² / 720k = 0.073 W
P_per 180 kΩ ≈ 0.018 W (18 mW)

At 400 Vac (worst-case):
I ≈ 400 / 720k = 0.56 mA
P_total = 400² / 720k = 0.222 W
P_per 180 kΩ ≈ 0.056 W (56 mW)

Thermal check (per resistor):
(180 kΩ / 0805 / 0.5 W)
→ P_max = 0.056 W ≈ 11 % load
→ ΔT ≈ P × Rθ = 0.056 W × (200–250 °C/W) ≈ +11 – 14 °C
→ T_resistor ≈ 60 °C + ΔT ≈ 71 – 74 °C < 155 °C (max)

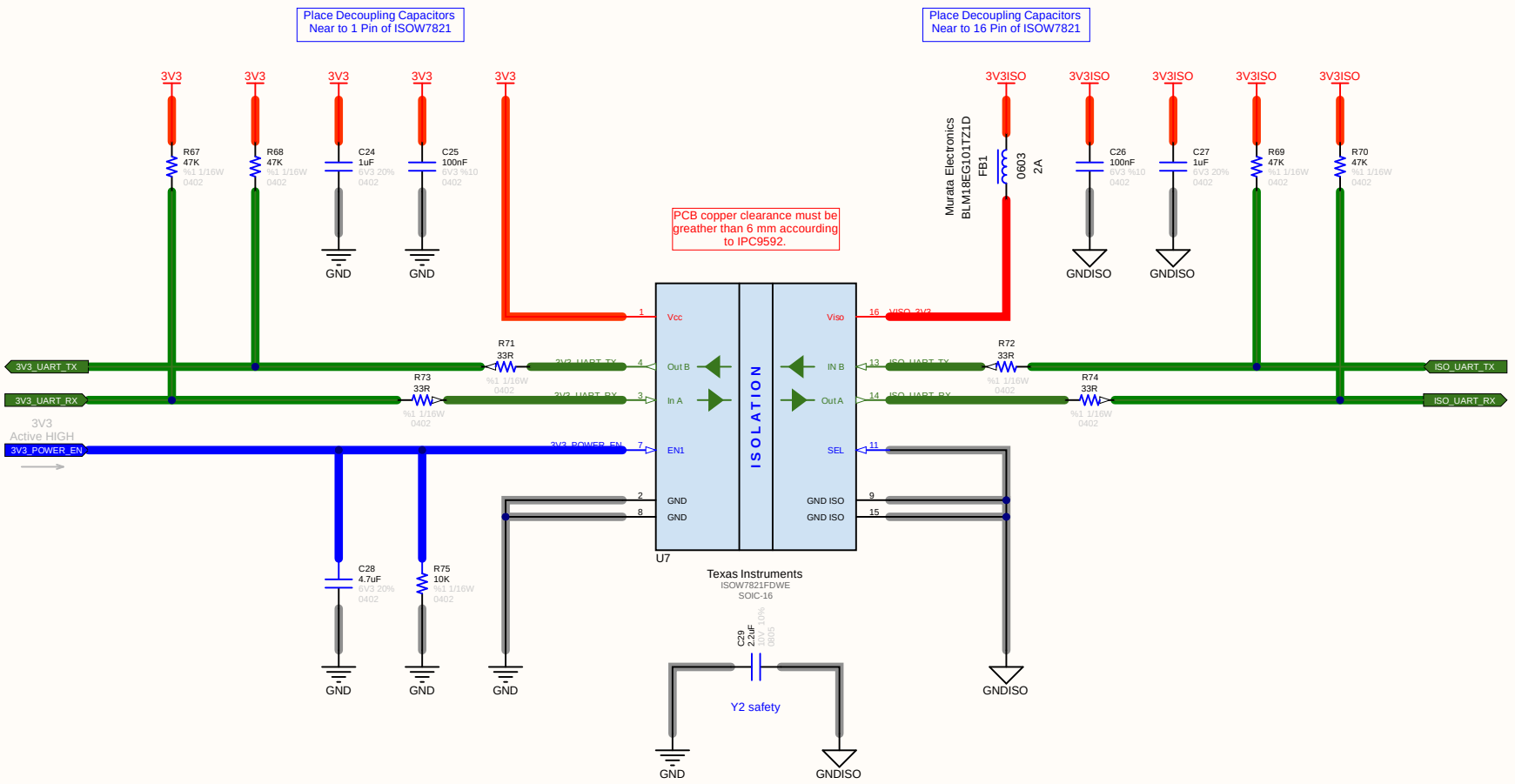
Safe operating region confirmed
All resistors within voltage, power, and thermal limits.

PCB copper clearance must be greather than 6 mm accourding to IPC9592.



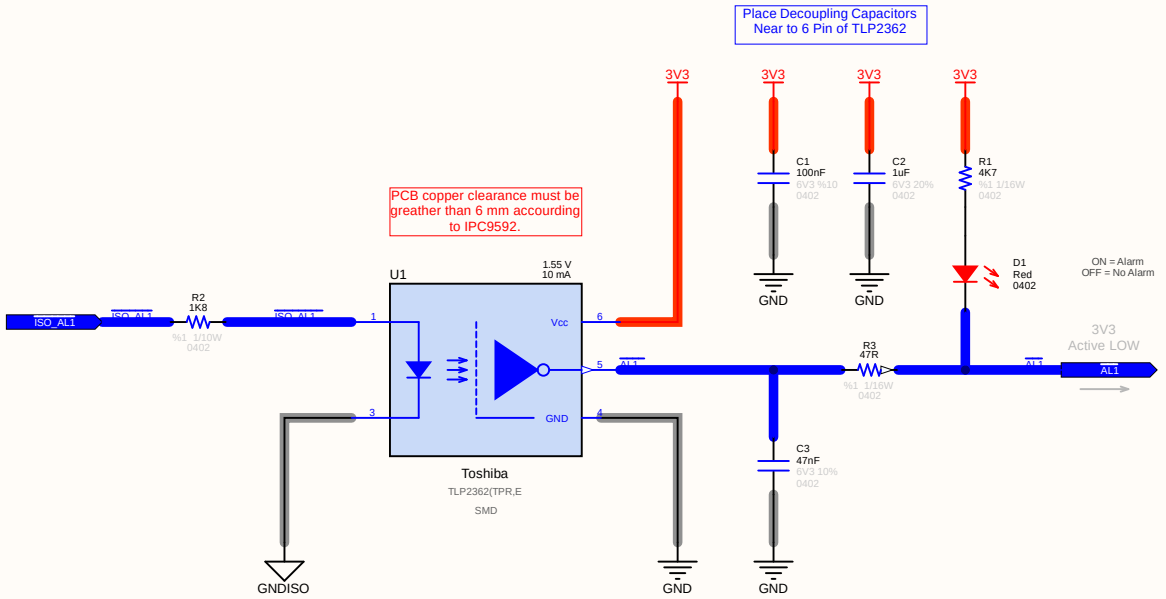
www.github.com/akkoyun/B202AA-PCIe

T Phase Sense Signal Isolation			Engineer : Gunce Akkoyun	-	stf
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB 103. Cad. No : 12 Selcuklu / Konya Türkiye	
			Module ID : B202AA-PCIe		
Date : 7.11.2025	Time : 15:54:17	Page : 5 / 12	Version : R1		
File : T Phase Sense Signal Isolation.SchDoc			Revision : 00.00.01		



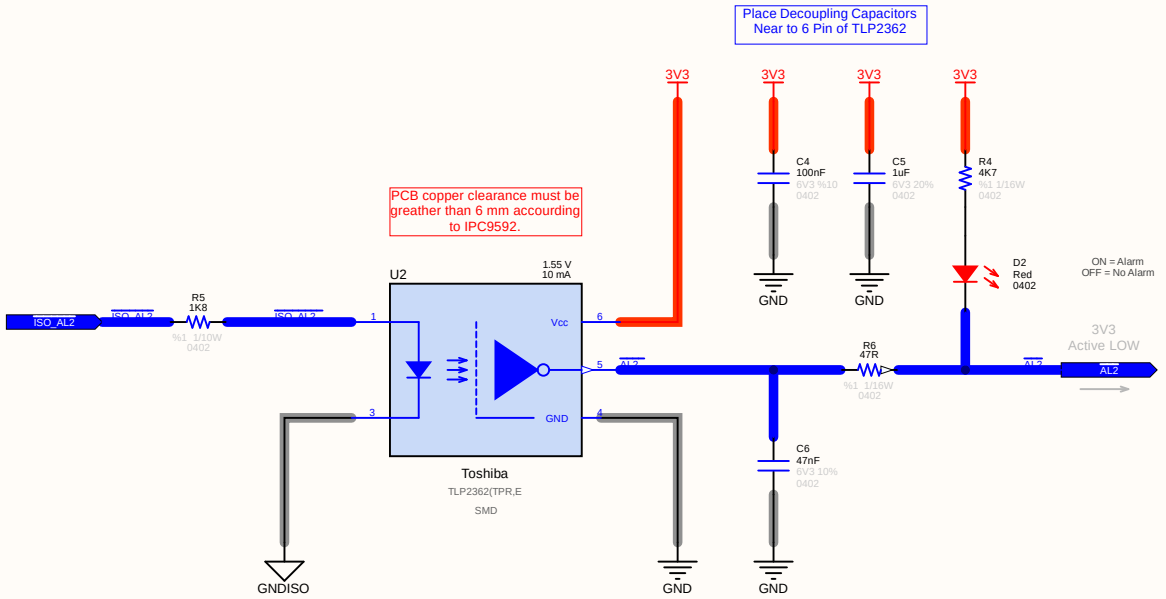
www.github.com/akkoyun/B202AA-PCIe

UART Isolation		Engineer : Gunce Akkoyun	-
		Customer : -	
Size : A4	Project : PollyPhase Energy Analyzer	Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB
		Module ID : B202AA-PCIe	103. Cad. No : 12
Date : 7.11.2025	Time : 15:54:17 Page : 6 / 12	Version : R1	Selcuklu / Konya Türkiye
File : UART Comm Isolation.SchDoc		Revision : 00.00.01	



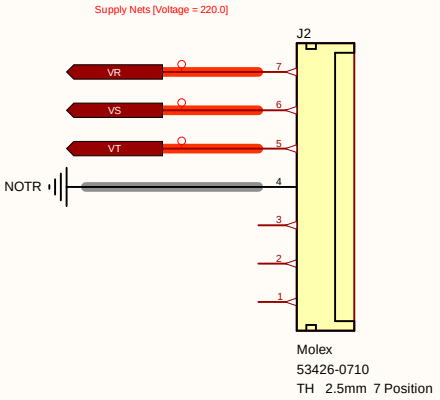
www.github.com/akkoyun/B202AA-PCIe

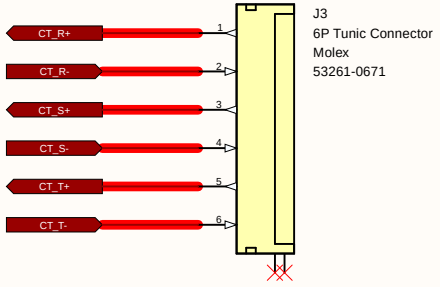
AL1 Signal Isolation			Engineer : Gunce Akkoyun	-
			Customer : -	
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB
			Module ID : B202AA-PCIe	103. Cad. No : 12
Date : 7.11.2025	Time : 15:54:17	Page : 7 / 12	Version : R1	Selcuklu / Konya Türkiye
File : AL1 Signal Isolation.SchDoc			Revision : 00.00.01	



www.github.com/akkoyun/B202AA-PCIe

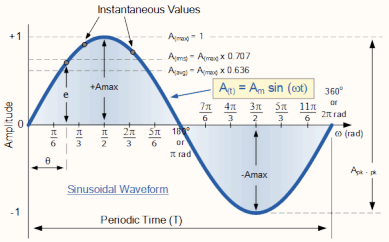
AL2 Signal Isolation			Engineer : Gunce Akkoyun	-	
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB	stf
Date : 7.11.2025	Time : 15:54:17	Page : 8 / 12	Module ID : B202AA-PCIe	103. Cad. No : 12	
File : AL2 Signal Isolation.SchDoc			Version : R1	Selcuklu / Konya Türkiye	
			Revision : 00.00.01		





www.github.com/akkoyun/B202AA-PCIe

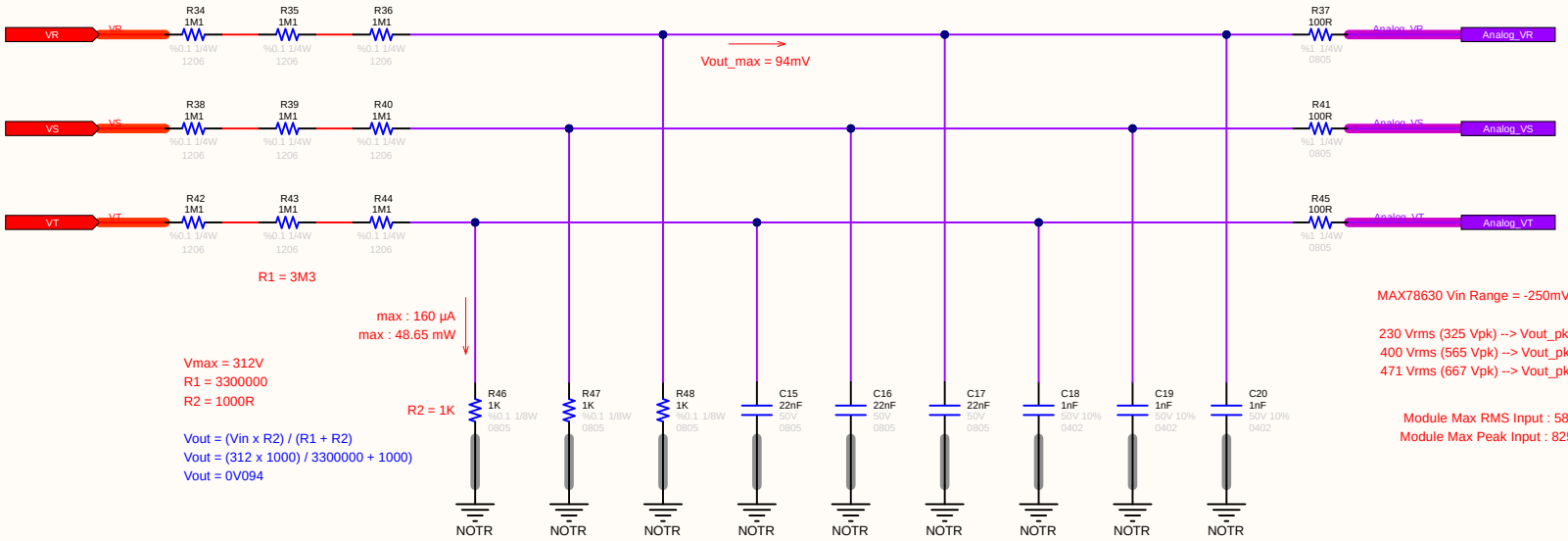
Energy Inputs		Engineer : Gunce Akkoyun	-	stf
		Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer	Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB	
		Module ID : B202AA-PCIe	103. Cad. No : 12	
Date : 7.11.2025	Time : 15:54:17 Page : 9 / 12	Version : R1	Selcuklu / Konya Türkiye	
File : Energy Inputs.SchDoc		Revision : 00.00.01		



Voltage Divider Performance Summary

- Maximum Input Voltage (RMS): 584 V
- Maximum ADC Input (Full Scale): ±250 mV
- Gain Error (Initial): ±0.14 %
- Gain Drift (0–70 °C): ±0.18 %
- Phase Shift @ 50 Hz: −0.40°
- Power Error (PF = 0.9, uncompensated): −0.34 %
- Power Error (PF = 0.5, uncompensated): −1.21 %
- Power Error (after compensation): < 0.05 %
- Long-Term Gain Stability: ±0.2 %
- Safety Margin (vs 400 V RMS system): ≈ 45 %

Vrms = 220V
Vmax = Vrms / 0.707 = 312V
Vpk-pk = 624V



Vmax = 312V
R1 = 3300000
R2 = 1000R

Vout = (Vin x R2) / (R1 + R2)
Vout = (312 x 1000) / 3300000 + 1000)
Vout = 0V094

MAX78630 Vin Range = -250mV - + 250mV

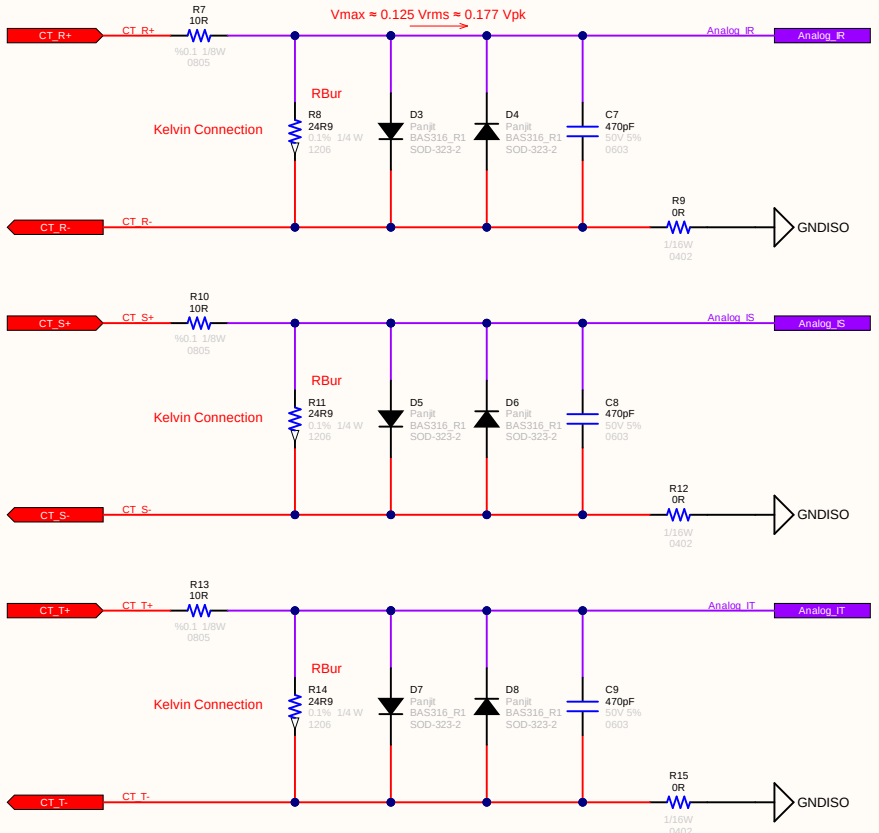
230 Vrms (325 Vpk) --> Vout_pk = 98.5 mV
400 Vrms (565 Vpk) --> Vout_pk = 171 mV
471 Vrms (667 Vpk) --> Vout_pk = 202 mV

Module Max RMS Input : 584 Vrms
Module Max Peak Input : 825 Vpeak

www.github.com/akkoyun/B202AA-PCIe

3 Phase Voltage Dividers			Engineer : Gunce Akkoyun	-	stf
			Customer : -		
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB	
			Module ID : B202AA-PCIe	103. Cad. No : 12	
Date : 7.11.2025	Time : 15:54:17	Page : 10 / 12	Version : R1	Selcuklu / Konya Türkiye	
File : Phase Voltage Dividers.SchDoc			Revision : 00.00.01		

Operating Range
- Nominal current (5 A rms): 0.125 V rms = 0.177 V pk
- Max current (7 A rms): 0.174 V rms = 0.246 V pk
- MAX78630 input limit: ±250 mV pk
- Utilization: ≈ 98 % of full-scale (ideal range)
- Burden dissipation: < 2 mW, no thermal drift concern



CT Clamp Protection Explanation

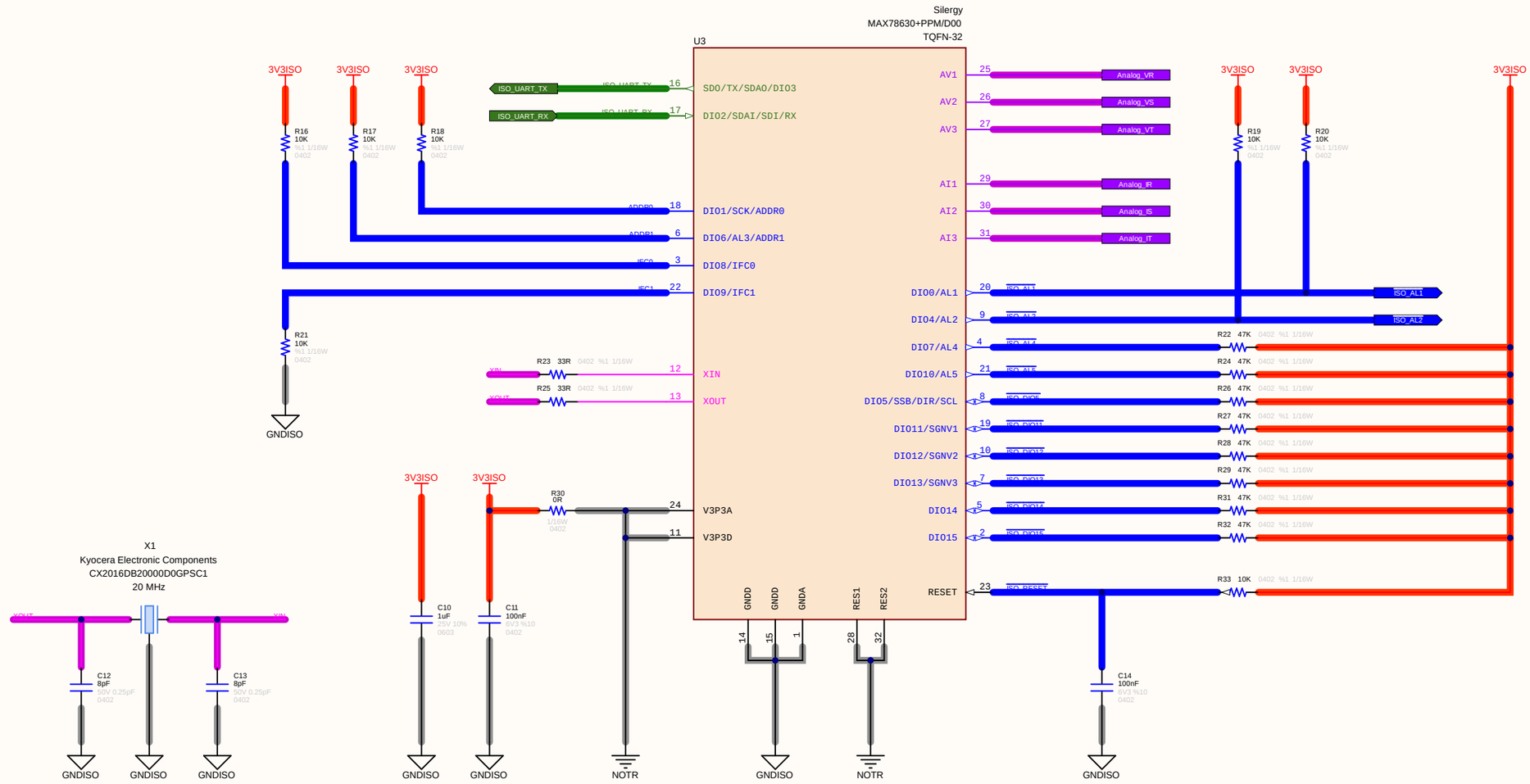
Each current transformer (CT) channel includes a pair of antiparallel signal diodes (BAS316) connected across the burden resistor. These diodes normally remain non-conductive because the operating voltage across the burden (≈ 0.25 Vpk at 7 $A_{(rms)}$) is far below the diode forward voltage (~ 0.7 V).

If the CT circuit becomes open-circuited (e.g., connector unplugged, broken wire, or burden failure), the CT behaves as a current source and its secondary voltage can rise to several hundred volts. In that case, the diodes conduct and clamp the voltage to ±0.7 V, protecting both the MAX78630 input and the surrounding circuitry.

Thus, the diodes act only as a safety clamp during abnormal conditions, without affecting normal measurement accuracy or phase angle.

www.github.com/akkoyun/B202AA-PCIe

3 Phase Current Voltage Dividers			Engineer : Gunce Akkoyun	-
			Customer : -	
Size : A4	Project : PollyPhase Energy Analyzer		Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB
			Module ID : B202AA-PCIe	103. Cad. No : 12
Date : 7.11.2025	Time : 15:54:17	Page : 11 / 12	Version : R1	Selcuklu / Konya Türkiye
File : Current Voltage Dividers.SchDoc			Revision : 00.00.01	



www.github.com/akkoyun/B202AA-PCIe

MAX78630 SOC Core		Engineer : Gunce Akkoyun	-
		Customer : -	
Size : A4	Project : PollyPhase Energy Analyzer	Product ID : B202AA-PCIe	Buyuk Kayacik Mah. 4. OSB
		Module ID : B202AA-PCIe	103. Cad. No : 12
Date : 7.11.2025	Time : 15:54:18 Page : 12 / 12	Version : R1	Selcuklu / Konya Türkiye
File : MAX78630 SOC.SchDoc		Revision : 00.00.01	