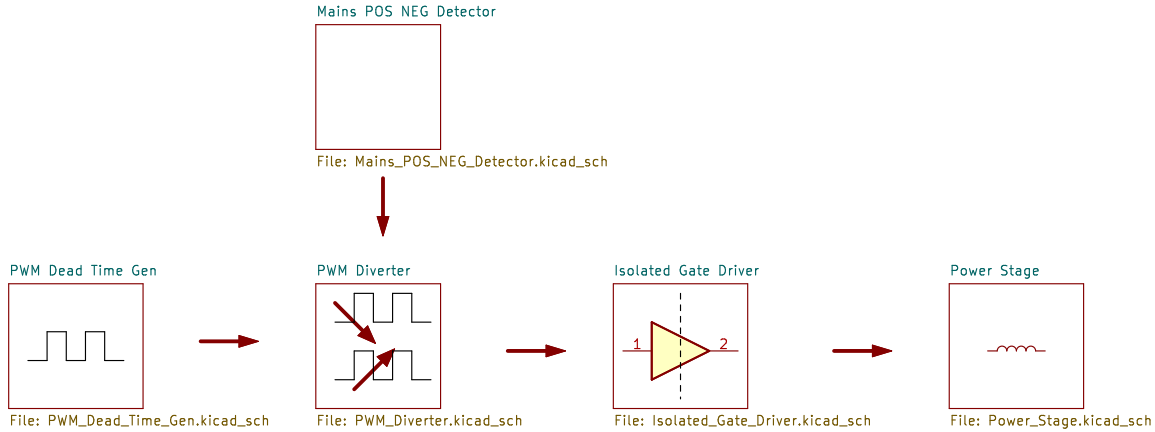


The wave forms try to match the ones in this papper

http://wrap.warwick.ac.uk/135348/1/WRAP-reliable-control-direct-PWM-AC-AC%20buck-converter-short-circuit-protection-Wang-2019.pdf

Found this papper after comming up with this design
Helps show the gate driver is a good idea

https://ieeexplore.ieee.org/document/290613

Havent looked at yet but from the pictures looks helpful

https://ieeexplore.ieee.org/document/7420054

Kei Carden

Sheet: /
File: AC AC Buck PWM.kicad_sch

Title: AC AC Buck

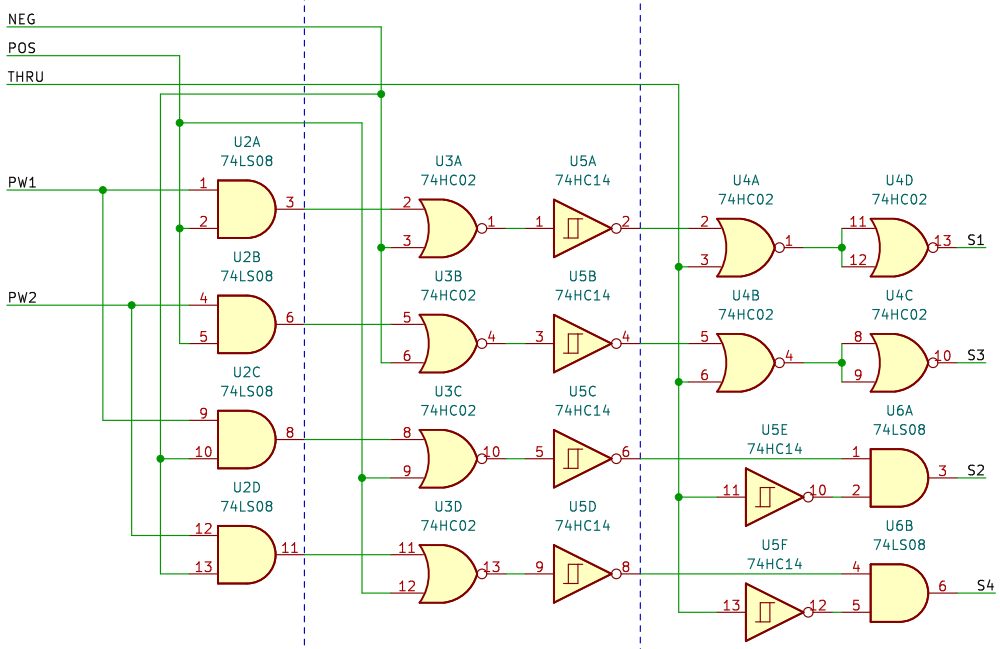
Size: A4	Date: 2023-04-19	**Rev: V1**
KiCad E.D.A. kicad (6.0.7-1)-1		Id: 1/6

Diverter Logic

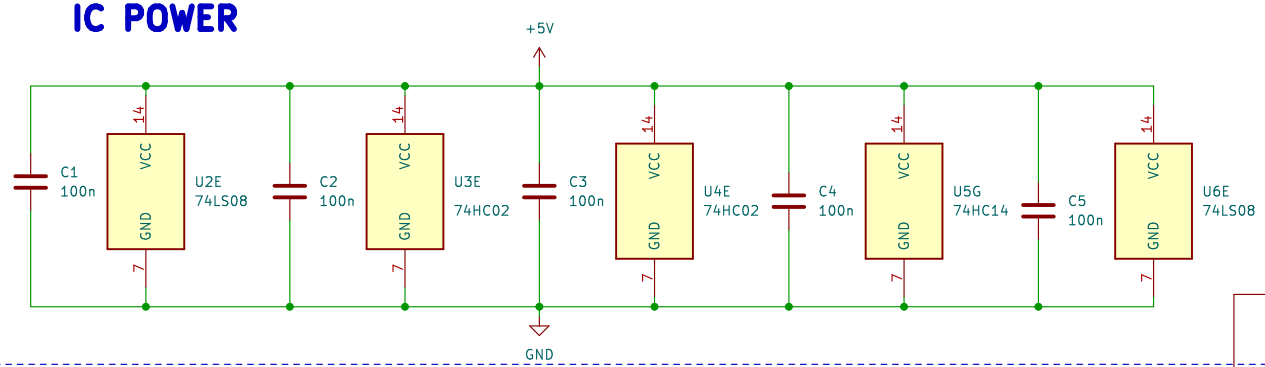
Diverting Stage

Blanking Stage

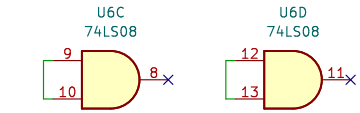
Zero Crossing Stage



IC POWER



Unused



What the gates do

First & are used to divert the PWM to wither S1&S3 what POS is H and S2&S4 when NEG is H
The (NOR + Inverter create a or did it this way as I had not ORs on hand)
This is used to set the sitches which are not PWMing to H. E.G. S2&S4 are H when S1&S3 have the PWM.
The last section made up of and not and inverters is used for the zero crossing. When the zero corssing is H then S1&S3 are H and S2&S4 are L

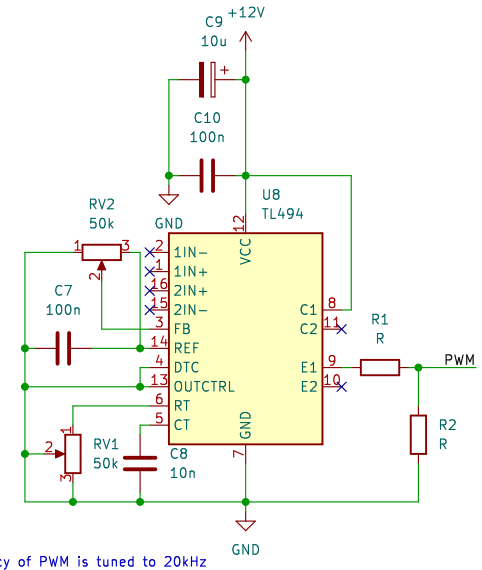
Kei Carden

Sheet: /PWM Diverter/
File: PWM_Diverter.kicad_sch

Title: PWM Diverter

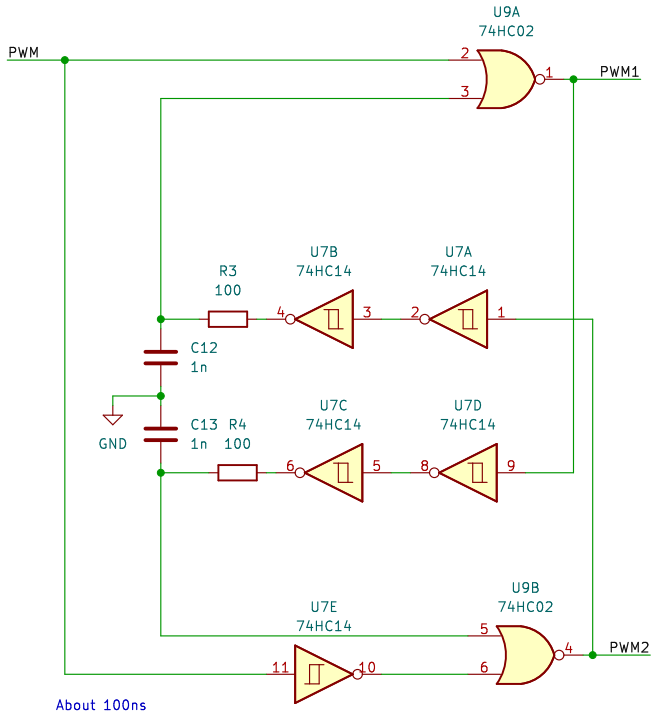
Size: A4	Date: 2023-04-19	**Rev: V2**
KiCad E.D.A. kicad (6.0.7-1)-1		Id: 2/6

PWM Generation



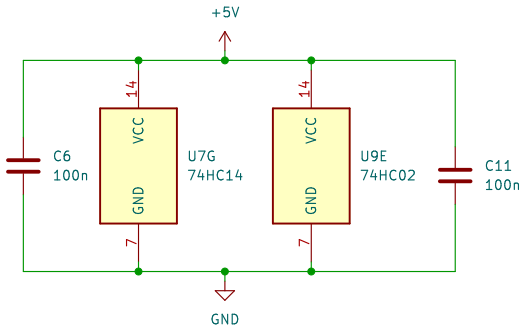
Frequency of PWM is tuned to 20kHz

Deadtime

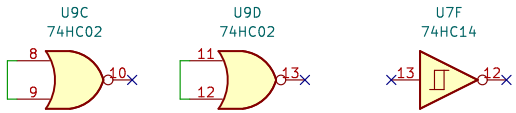


About 100ns

Logic Gate Power

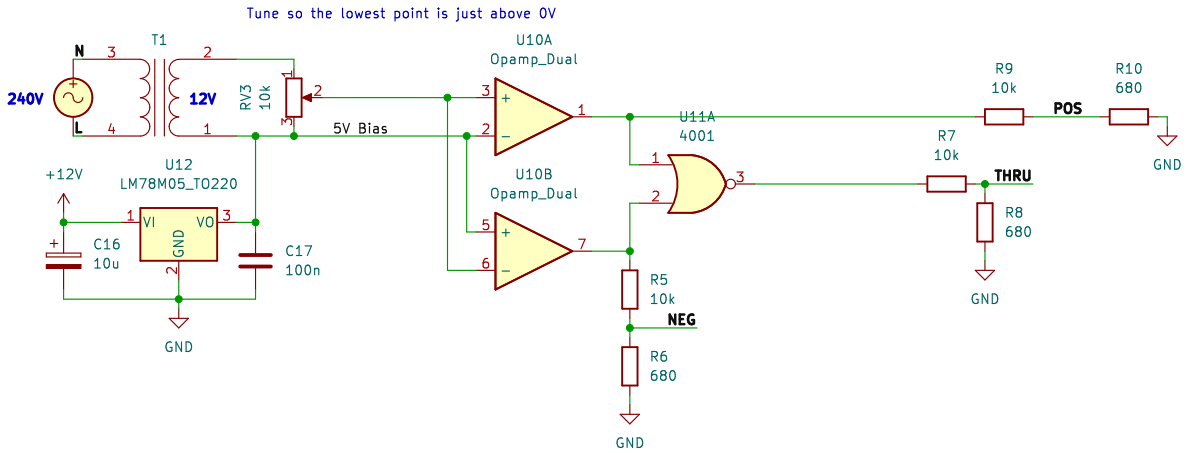


Not Used

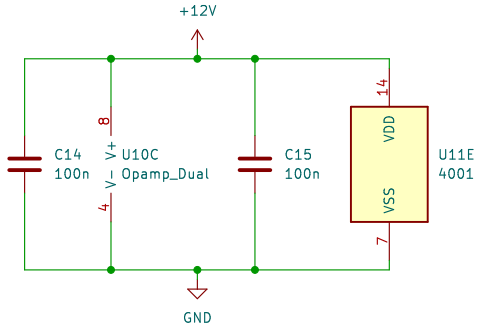


Kei Carden		
Sheet: /PWM Dead Time Gen/		
File: PWM_Dead_Time_Gen.kicad_sch		
Title: PWM & Dead Time Generator		
Size: A4	Date: 2023-04-19	**Rev: V1**
KiCad E.D.A. kicad (6.0.7-1)-1		Id: 3/6

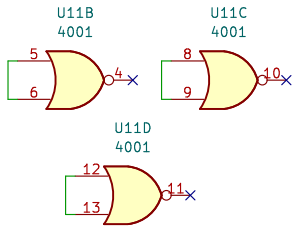
Detection Logic



IC Power



Unused



Kei Carden		
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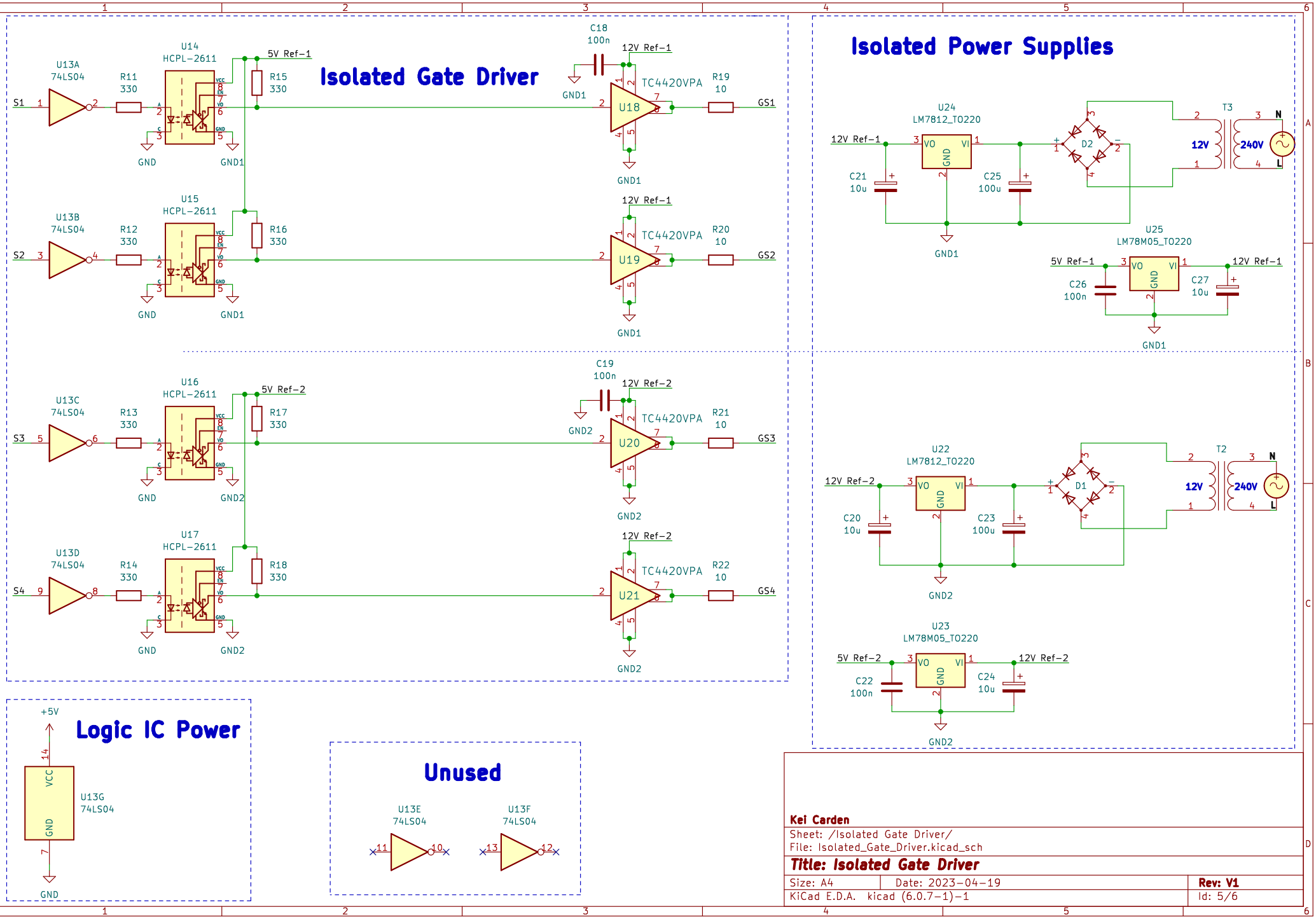
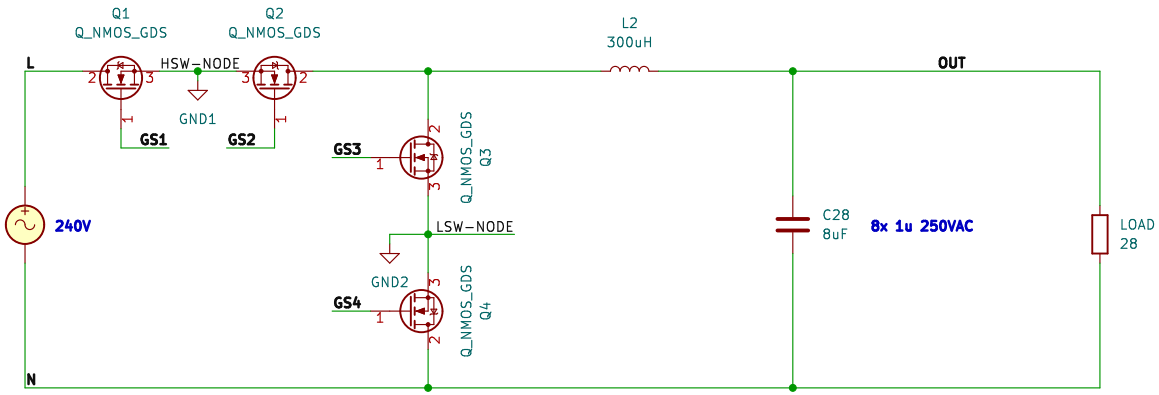
File: Mains_POS_NEG_Detector.kicad_sch		
Title: Mains POS NEG Detector		
Size: A4	Date: 2023-04-19	**Rev: V1**
KiCad E.D.A. kicad (6.0.7-1)-1		Id: 4/6


Isolated Gate Driver
U13A
74LS04
R11
330
U14
HCPL-2611
5V Ref-1
R15
330
C18
100n
12V Ref-1
TC4420VPA
U18
R19
10
S1
GS1
GND
GND1
U13B
74LS04
R12
330
U15
HCPL-2611
R16
330
U19
R20
10
S2
GS2
U13C
74LS04
R13
330
U16
HCPL-2611
5V Ref-2
R17
330
C19
100n
12V Ref-2
U20
R21
10
S3
GS3
GND2
U13D
74LS04
R14
330
U17
HCPL-2611
R18
330
U21
R22
10
S4
GS4
Isolated Power Supplies
U24
LM7812_TO220
12V Ref-1
C21
10u
C25
100u
D2
T3
12V
240V
N
L
U25
LM78M05_TO220
5V Ref-1
C26
100n
C27
10u
U22
LM7812_TO220
12V Ref-2
C20
10u
C23
100u
D1
T2
U23
LM78M05_TO220
5V Ref-2
C22
100n
C24
10u
Logic IC Power
+5V
U13G
74LS04
VCC
GND
Unused
U13E
74LS04
U13F
74LS04
Kei Carden
Sheet: /Isolated Gate Driver/
File: Isolated_Gate_Driver.kicad_sch
Title: Isolated Gate Driver
Size: A4
Date: 2023-04-19
Rev: V1
KiCad E.D.A. kicad (6.0.7-1)-1
Id: 5/6

Power Stage



Kei Carden		
Sheet: /Power Stage/ File: Power_Stage.kicad_sch		
Title: Power Stage		
Size: A4	Date: 2023-04-19	**Rev: V1**
KiCad E.D.A. kicad (6.0.7-1)-1		Id: 6/6