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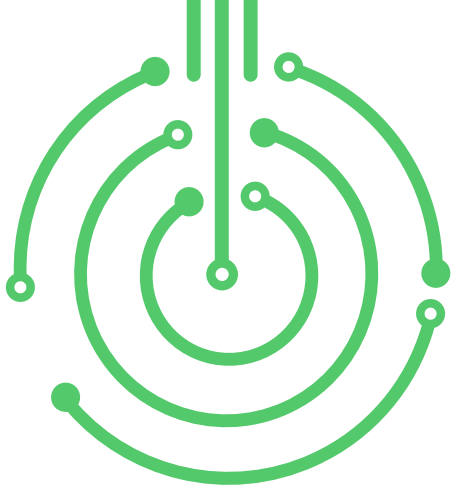


1200V Inverter Module for 3 Phase Motors up to 2KW

SKU: EL154498

1200V Inverter Module for 3 Phase Motors Up to 2KW

The power board described here is designed for motor applications, featuring the 6ED2230S12T gate driver IC and FP15R12W1T4 IPM power module from Infineon. It provides an AC input and a 3-phase power output, with a single emitter shunt for current sensing and a voltage divider for DC-link voltage measurement. The board includes an LM1117S33 linear regulator to generate 3.3V from the 15V VCC, which is used to supply the gate driver IC and other related circuits.

FEATURES

- Power Input 3Phase or Single-Phase AC Input (Minimum Power Supply 200V DC and Maximum Power Supply 800V DC)
- Load 2Amp RMS (Load Up to 2KW)
- I-Trip 6AmpsPeak
- Gate Driver Power Input VCC 15V DC
- IGBT Module Temperature Feed Back
- All PWM inputs has pull down resistors
- ON Board Power LED
- Matched propagation delay for all channels
- Matched propagation delays
- 3.3 V, 5 V, and 15 V input logic compatible
- Undervoltage lockout protection
- Floating channel designed for bootstrap operation
- Shoot-Through protection
- Fault reporting, automatic Fault clear and Enable function on the same pin (RFE)
- Fault reporting and programmable fault clear timer
- Over current protection with ±5% ITRIP threshold

- Truth table: Undervoltage lockout, ITRIP, and ENABLE
- Advanced input filter
- Short-Pulse / Noise rejection
- Ultra-fast, Integrated bootstrap diodes
- Negative VS transient SOA
- PCB Dimensions 111.76X74.93MM
- 4X4MM PCB Mounting Holes

Danger: The project operates with lethal voltage, user must take care of safety and all necessary precautions before testing the project.

Note: The compact IPM module and gate driver chip provide a fully-featured, high-performance inverter output stage for AC induction, BLDC, and PMSM motors.

Overcurrent protection circuitry (R27+R28= Shunt Resistors and R24 and R31 provides current feedback output through CN5)

The comparator threshold can be set via the voltage divider. The ITRIP pin senses this voltage. Once an overcurrent event is detected, the driver IC outputs are shut down, and the RFE pin is pulled down to GND. The resistance value of the shunt resistors (2 x 0.33 ohm in parallel, which are used to detect the overcurrent event) is chosen to sense 6A peak current through the shunt resistors which will trigger the overcurrent protection and shut down the outputs of gate driver IC. In case a different current level is preferred (e.g., under different load conditions), the shunt resistor needs to be adjusted accordingly, taking into consideration voltage drop and power dissipation.

RFE (CN1 Pin 3)

Integrated fault reporting function like over-current (ITRIP), or low-side undervoltage lockout and the fault clear timer. This pin has negative logic and an open-drain output.

Dead-time consideration

To guarantee proper system functioning and to prevent shoot-through, a minimum of 1 us dead time is recommended from the controller side.

DC Bus Link Voltage Feedback

The project includes DC bus voltage feedback divider resistors (R26, R30, R34, R33, and R32) that provide a feedback voltage of 0.22V at 400V DC bus voltage and 0.33V at 600V DC bus voltage, accessible through pin 1 of CN1 (GND). Additionally, bleeding resistors R22 and R25 (1M/3W) are used to discharge bus capacitors C8 and C9 when power is off.

Bleeding Resistors

R22 and R25 1M/3W are bleeding resistors used to discharge bus capacitors C8 and C9 when powered off.

Danger: It is important to note that the project operates with lethal voltage, and users must take all necessary safety precautions before testing the board. After the power is off, the DC bus capacitors remain charged and have lethal voltage, requiring an appropriate waiting time for capacitor discharge before conducting tests.

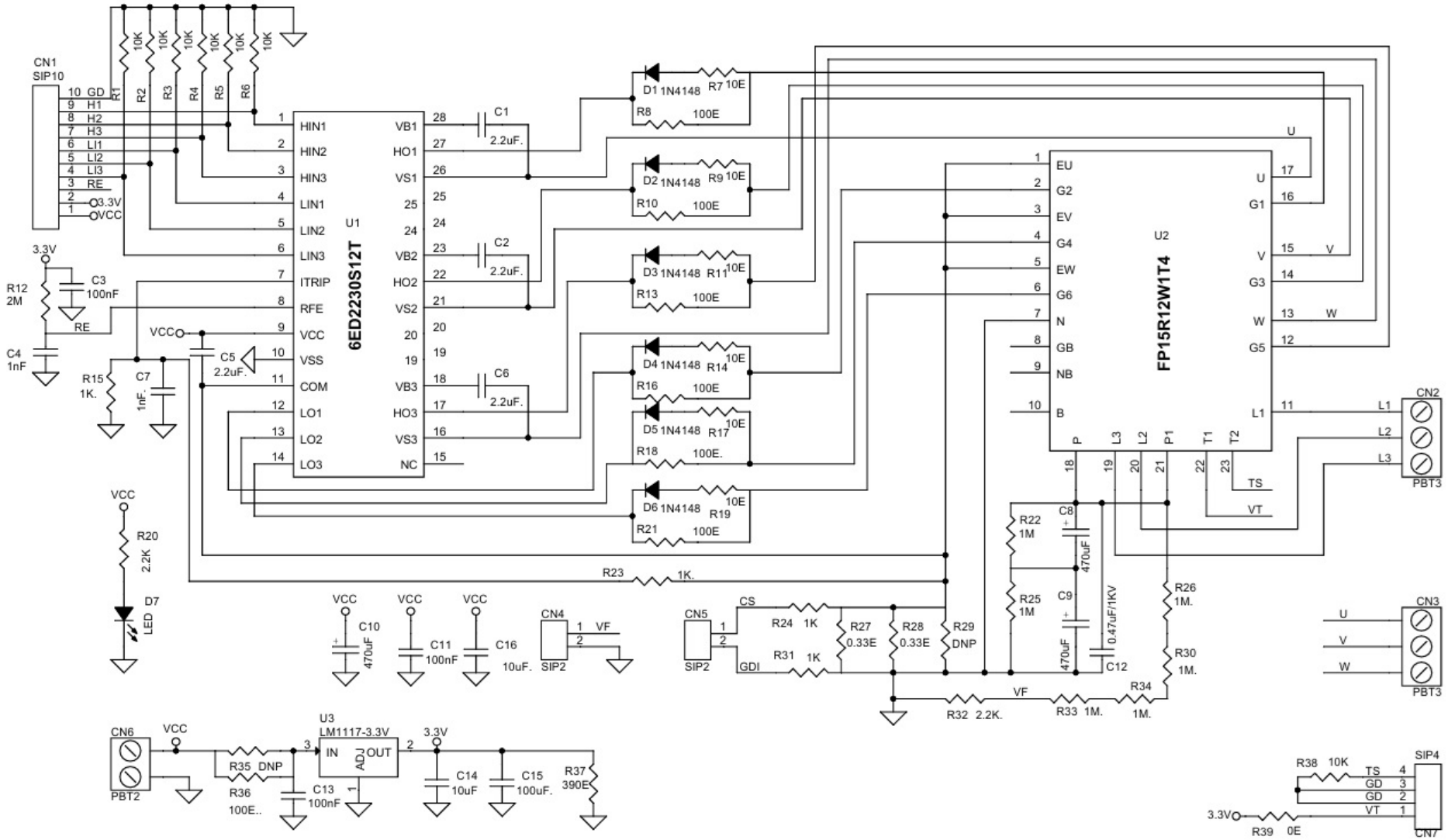
Data Sheet

Users are also advised to refer to the datasheets of the gate driver chips and IGBT module chips before testing the board and follow the PWM input timing diagram for smooth operation.

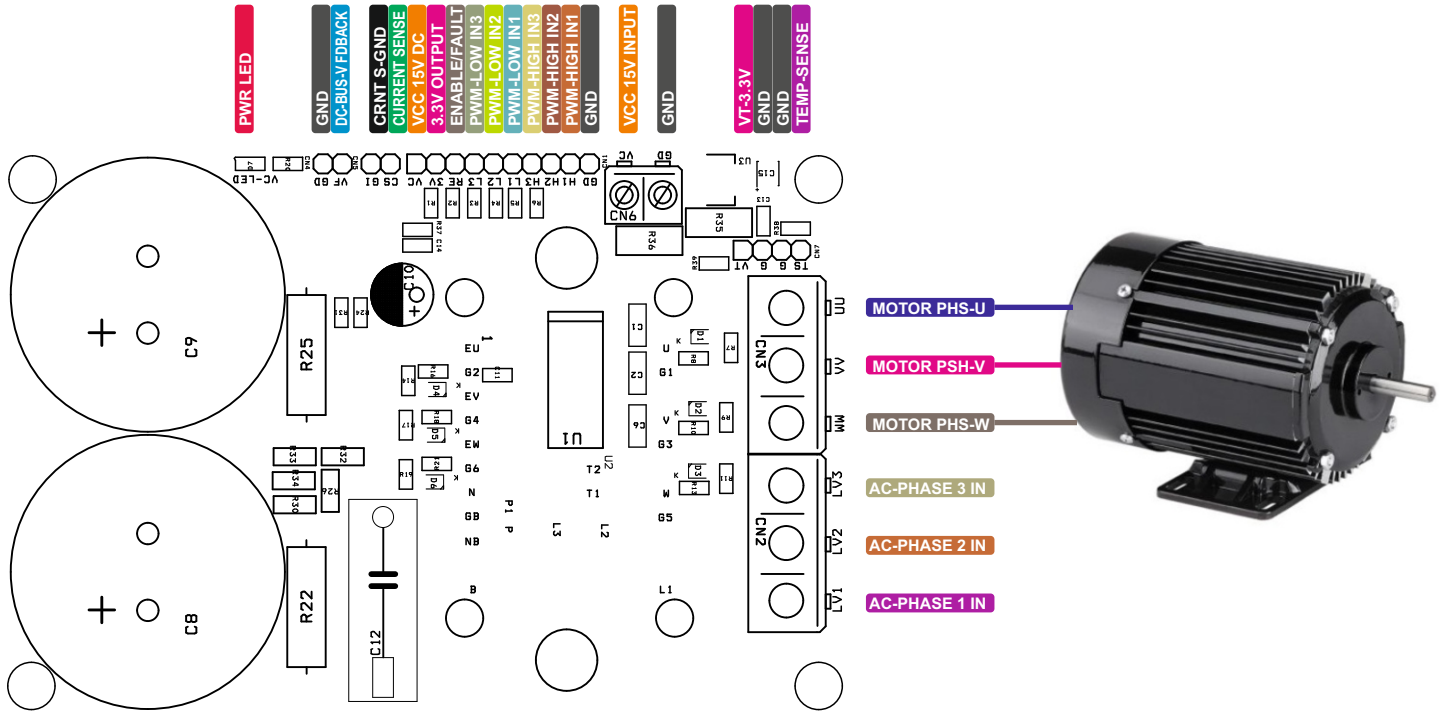
Gate Driver Chip

The 6ED2230S12T is a high voltage, high speed IGBT with three independent high side and low side referenced output channels for three phase applications. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The logic input is compatible with standard CMOS or TTL outputs, down to 3.3 V logic. An over-current protection (OCP) function which terminates all six outputs can also be derived from this resistor. An open drain FAULT signal is provided to indicate that an over-current or undervoltage shutdown has occurred. Fault conditions are cleared automatically after a delay programmed externally via an RC network. The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. The floating channel can be used to drive N-channel power MOSFETs or IGBTs in the high side configuration which operates up to 1200 V. Propagation delays are matched to simplify the HVIC's use in high frequency applications.

Schematic


CN1
SIP10
10 GD
9 H1
8 H2
7 H3
6 LI1
5 LI2
4 LI3
3 RE
2 3.3V
1 VCC
R1 10K
R2 10K
R3 10K
R4 10K
R5 10K
R6 10K
U1
6ED2230S12T
HIN1
HIN2
HIN3
LIN1
LIN2
LIN3
ITRIP
RFE
VCC
VSS
COM
LO1
LO2
LO3
VB1
HO1
VS1
VB2
HO2
VS2
VB3
HO3
VS3
NC
C1 2.2uF.
C2 2.2uF.
C6 2.2uF.
C5 2.2uF.
C3 100nF
R12 2M
C4 1nF
R15 1K.
C7 1nF.
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4148
D5 1N4148
D6 1N4148
R7 10E
R8 100E
R9 10E
R10 100E
R11 10E
R13 100E
R14 10E
R16 100E
R17 10E
R18 100E.
R19 10E
R21 100E
U2
FP15R12W1T4
EU
G2
EV
G4
EW
G6
N
GB
NB
B
U
G1
V
G3
W
G5
L1
P
L3
L2
P1
T1
T2
TS
VT
CN2
PBT3
R22 1M
R25 1M
R26 1M.
R30 1M.
C8 470uF
C9 470uF
C12 0.47uF/1KV
R23 1K.
R20 2.2K
D7 LED
C10 470uF
C11 100nF
C16 10uF.
CN4
SIP2
CN5
SIP2
CS
GDI
R24 1K
R31 1K
R27 0.33E
R28 0.33E
R29 DNP
R32 2.2K.
R33 1M.
R34 1M.
VF
CN3
PBT3
CN6
PBT2
U3
LM1117-3.3V
IN
ADJ
OUT
R35 DNP
R36 100E..
C13 100nF
C14 10uF
C15 100uF.
R37 390E
R38 10K
SIP4
TS
GD
GD
VT
R39 0E
CN7

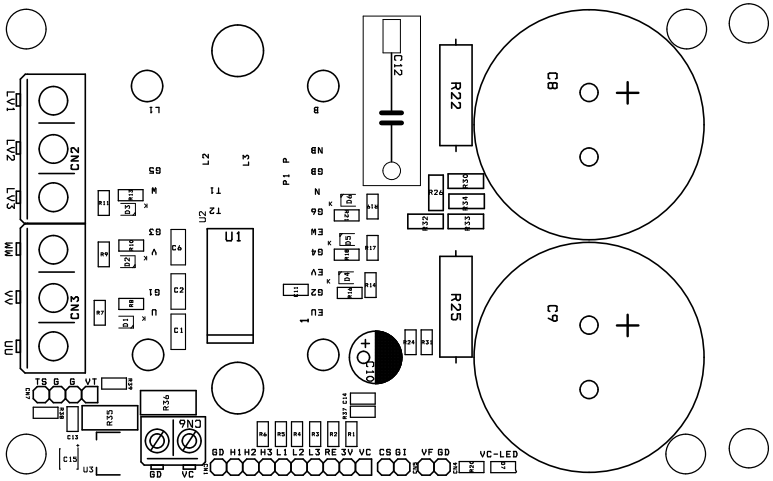
Connections



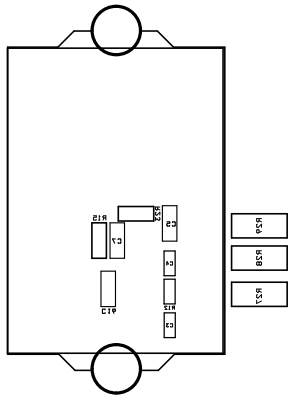
Connections

- CN1: Pin 10 = GND, Pin 9 = PWM High 1 In, Pin 8 = PWM High 2 In, Pin 7 = PWM High 3 In, Pin 6 = PWM Low 1 In, Pin 5 = PWM Low 2 In, Pin 4 = PWM Low 3 In, Pin 3 = RE Enable/Fault, Pin 2 = 3.3V Output Maximum 800mA, Pin 1 = VCC 15V DC Input
- CN2 AC Power Input: Pin 1 = L1/AC Phase Input 1, Pin 2 = L2/AC Phase 2 Input, Pin 3 = L3/AC Phase 3 Input
- CN3 Motor: Pin 1 = Phase U, Pin 2 = Phase V, Pin 3 = Phase W
- CN4 DC Bus Voltage Feedback: Pin 1 = Voltage Feedback, Pin 2 = GND
- CN5 Current Sense Output: Pin 1 = + Current Sense Output, Pin 2 = -Current Sense Output
- CN6 Gate Driver Power Input: Pin 1 VCC 15V Input, Pin 2 = GND
- CN7 Temperature Feedback: Pin 1 = Temperature Voltage Output (R38 divider resistor with Inbuilt NTC) , Pin 2 = GND, Pin 3 = GND, Pin 4 VT/3.3V Pull-Up
- D1: Power LED

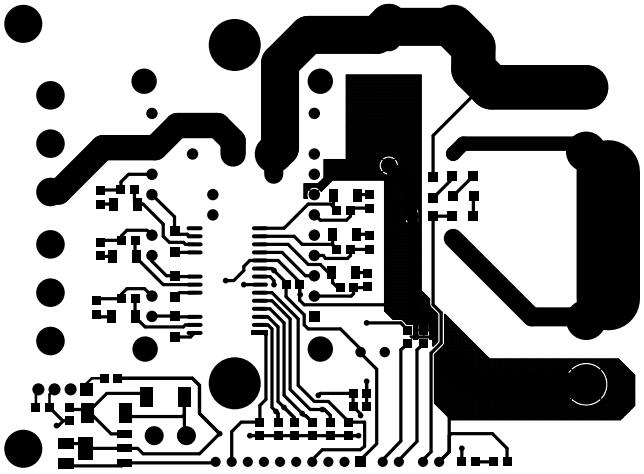
PCB



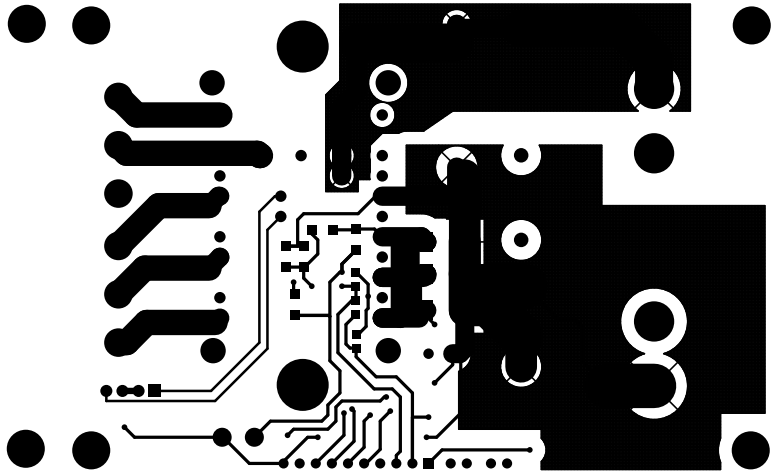
SILK SCREEN TOP



SILK SCREEN BOTTOM



TOP LAYER



BOTTOM LAYER

PCB Dimensions 111.76X74.93MM

PCB GERBER FILES AVAILABLE

Parts List

BOM						
NO	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	10 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-2670-ND
2	2	CN2,CN3	3 PIN SCREW TERMINAL PITCH 7.62MM	PHOENIX	DIGIKEY	277-5954-ND
3	2	CN4,CN5	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
4	1	CN6	2 PIN SCREW TERMINAL PITCH 2.54MM	PHOENIX	DIGIKEY	277-1247-ND
5	1	CN7	4 MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
6	4	C1,C2,C5,C6	2.2uF/35V X7R CERAMIC SMD SIZE 1206	KYOCERA	DIGIKEY	478-9949-1-ND
7	3	C3,C11,C13	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
8	1	C4	1nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
9	1	C7	1nF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
10	3	C8,C9,C10	470uF/450V 35MM DIA/30MM-H ELEKTROLYTIC	RUBYCON	DIGIKEY	1189-4275-ND
11	1	C12	0.47uF/1KV	EPCOS	DIGIKEY	495-B32653A0474J000-ND
12	1	C14	10uF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	1	C15	100uF/10V CERAMIC SMD SIZE 1206 OR 1210	YAGEO/MURATA	DIGIKEY	
14	1	C16	10uF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
15	6	D1,D2,D3,D4,D5,D6	1N4148 SMD	ONSEMI	DIGIKEY	LL4148FSCT-ND
16	1	D7	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
17	7	R1,R2,R3,R4,R5,R6,R38	10K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
18	6	R7,R9,R11,R14,R17,R19	10E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
19	6	R8,R10,R13,R16,R18, R21	100E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
20	1	R12	2M 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
21	2	R15,R23	1K 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
22	1	R20	2.2K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
23	2	R22,R25	1M/3W THT	TE CONNECTIVITY	DIGIKEY	A138410TB-ND
24	2	R24,R31	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
25	4	R26,R30,R33,R34	1M 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
26	2	R27,R28	0.33E/2W 1% SMD SIZE 2512	STACKEPOLE	DIGIKEY	CSRN2512FKR330CT-ND
27	2	R29,R35	DNP			
28	1	R32	2.2K 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
29	1	R36	100E/1W-2W 5% SMD SIZE 2512	YAGEO/MURATA	DIGIKEY	
30	1	R37	390E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
31	1	R39	0E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
32	1	U1	6ED2230S12T	INFINEON	DIGIKEY	448-6ED2230S12TXUMA1CT-ND
33	1	U2	FP15R12W1T4	INFINEON	DIGIKEY	FP15R12W1T4B3BOMA1-ND
34	1	U3	LM1117-3.3V	TI	DIGIKEY	LM1117MP-3.3/NOPBCT-ND
35	1	C10	470uF/25V	WURTH	DIGIKEY	732-8636-3-ND

Notes

APP

Android App

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