

LM5152-Q1 BOOST Controller Design Tool

Step 1: Design Specifications

Minimum Input Supply Voltage, $V_{SUPPLY(min)}$	5 V
Typical Input Supply Voltage, $V_{SUPPLY(typ)}$	12 V
Maximum Input Supply Voltage, $V_{SUPPLY(max)}$	30 V
Output Target Voltage, V_{LOAD}	10 V
Maximum Output Current, I_{LOAD}	4.00 A
Light load operation switching mode	DEM
Free Running Switching Frequency, F_{SW}	440 kHz
Free running Oscillator Set Resistor, R_1	49.27 k Ω
Output Power, P_{OUT}	40.0 W
Boost Converter Duty Cycle Limit of LM5152 at $V_{SUPPLY(MIN)}$	88.0 %
Ideal Duty Cycle at $V_{SUPPLY(MIN)}$	50.0 %

Step 2: Filter Inductor

Switching mode at $V_{SUPPLY(min)}$	CCM
Desired Maximum Inductor Current Ripple Ratio	66 %
Recommended Inductance (I_{LQ_CALC})	1.275 μ H
User Selection, Inductance, (I_{LQ})	1 μ H
Max Inductor DCR, R_{DCR}	2.8 m Ω
Peak inductor current, I_{Lpk}	10.84 A

Step 3: Current Sense Resistor Selection

Peak Current Limit Margin	20 %
Selected Peak Current limit (I_{PK_select})	13.51 A
Recommended current sense Resistor (R_S)	4.44 m Ω
Selected current sense Resistor (R_S)	4.44 m Ω
Actual inductor peak current limit	13.51 A

Step 4: Output Capacitor Selection

Desired load step ripple voltage (ΔV_{OUT})	150 mV
Load step at for the specified ΔV_{OUT} (ΔI_{OUT})	1 A
Minimum output capacitance	53.33 μ F
Selected Output Capacitance (C_{OUT})	180 μ F
Equivalent COUT ESR (R_{ESR})	9 m Ω

Step 6: Soft-Start Capacitor Selection

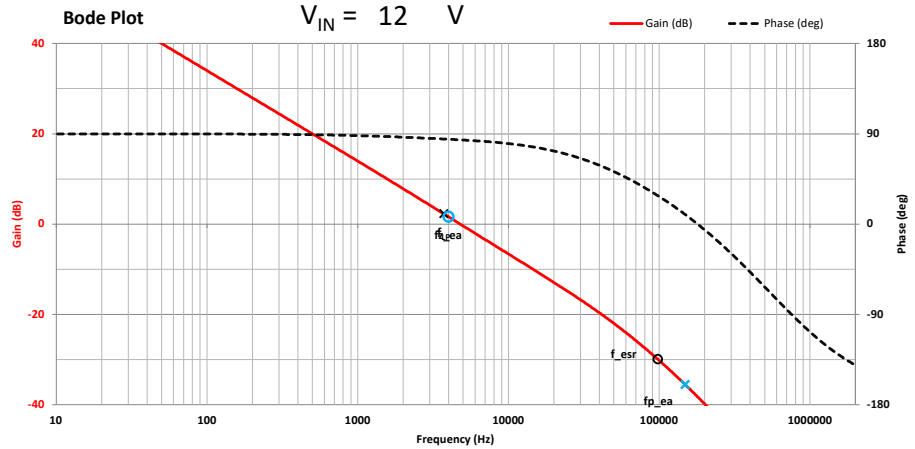
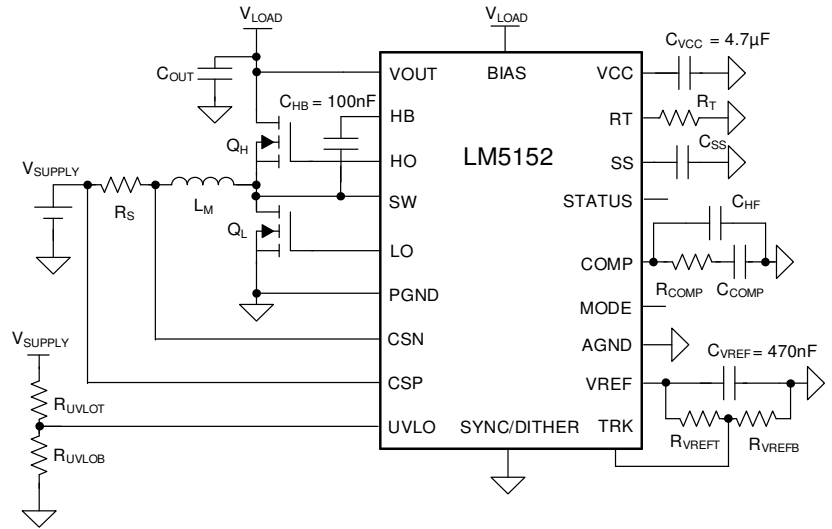
Suggested minimum soft-start capacitor (C_{SS_MIN})	9.00 nF
Desied soft-start time at minimum input voltage (T_{SS})	11 ms
Calculated soft-start capacitor (C_{SS})	440 nF

Step 5: UVLO Resistor Divider Selection

Desired voltage On (V_{UVLO_ON})	5.8 V
Desired voltage OFF (V_{UVLO_OFF})	5.3 V
Calculated top UVLO resistor value (R_{UVT_CALC})	36.82 k Ω
Selected top UVLO resistor value (R_{UVLOT})	36.5 k Ω
Bottom UVLO Resistor (R_{UVLOB})	8.543 k Ω

Step 7: Loop Compensation

Voltage selected (V_{IN_VAR})	12V
Track pin voltage to set the output voltage (V_{TRK})	0.500 V
Minimum value for (R_{VREF_min})	37.5 k Ω
Maximum value for (R_{VREF_max})	50.0 k Ω
Select a top VREF resistor between R_{VREF_min} and R_{VREF_max} (R_{VREF})	35 k Ω
Calculated bottom feedback resistor (R_{VREFB_CALC})	35.0 k Ω
Select a bottom resistor based on calculated balue (R_{VREFB})	52.5 k Ω
Suggested bandwidth (F_{CO_CALC})	19.9 kHz
Selected bandwidth (F_{CO})	5 kHz
Calculated	Selected
R_{COMP}	10.4 k Ω / 4 k Ω
C_{COMP}	6.6 nF / 9.9 nF
C_{HF}	105 pF / 275 pF



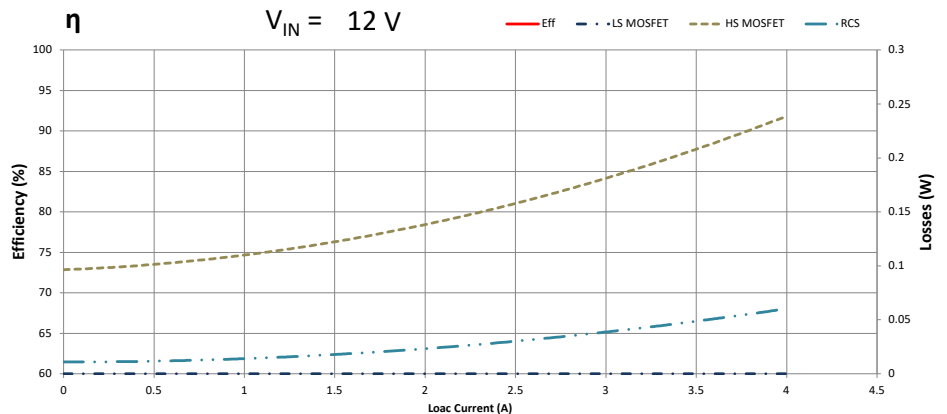
Efficiency / Power Loss Analyzer

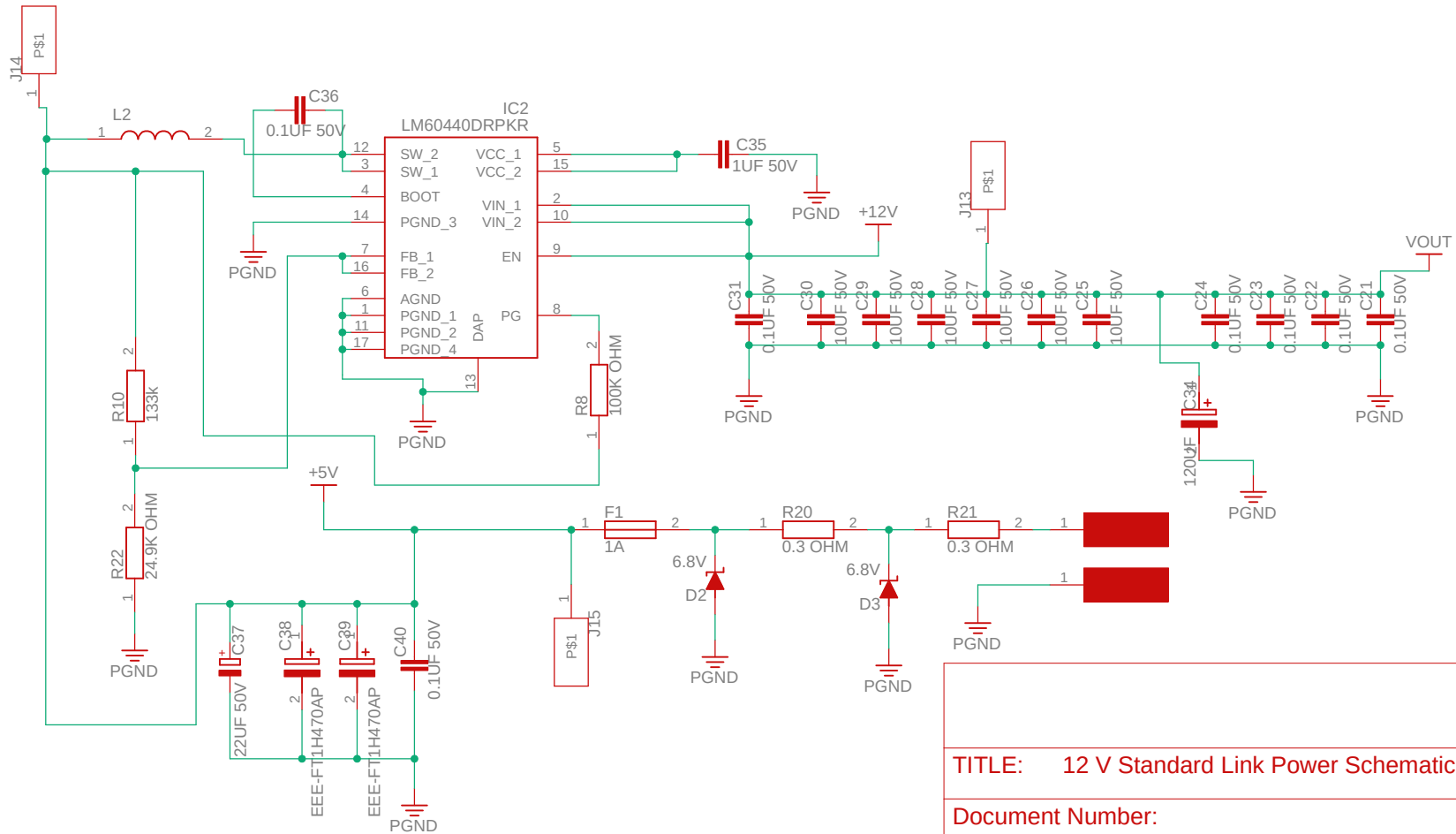
Low-Side MOSFET Parameters (Q_L)

On-State Resistance, $R_{DS(on)}$	8.8 m Ω
Total Gate Charge, Q_G	10 nC
Gate-Drain Charge, Q_{GD}	2.5 nC
Gate-Source Charge, Q_{GS}	4.5 nC
Gate Resistance, R_G	0 Ω
Gate-Source Threshold Voltage, V_{TH}	1.7 V

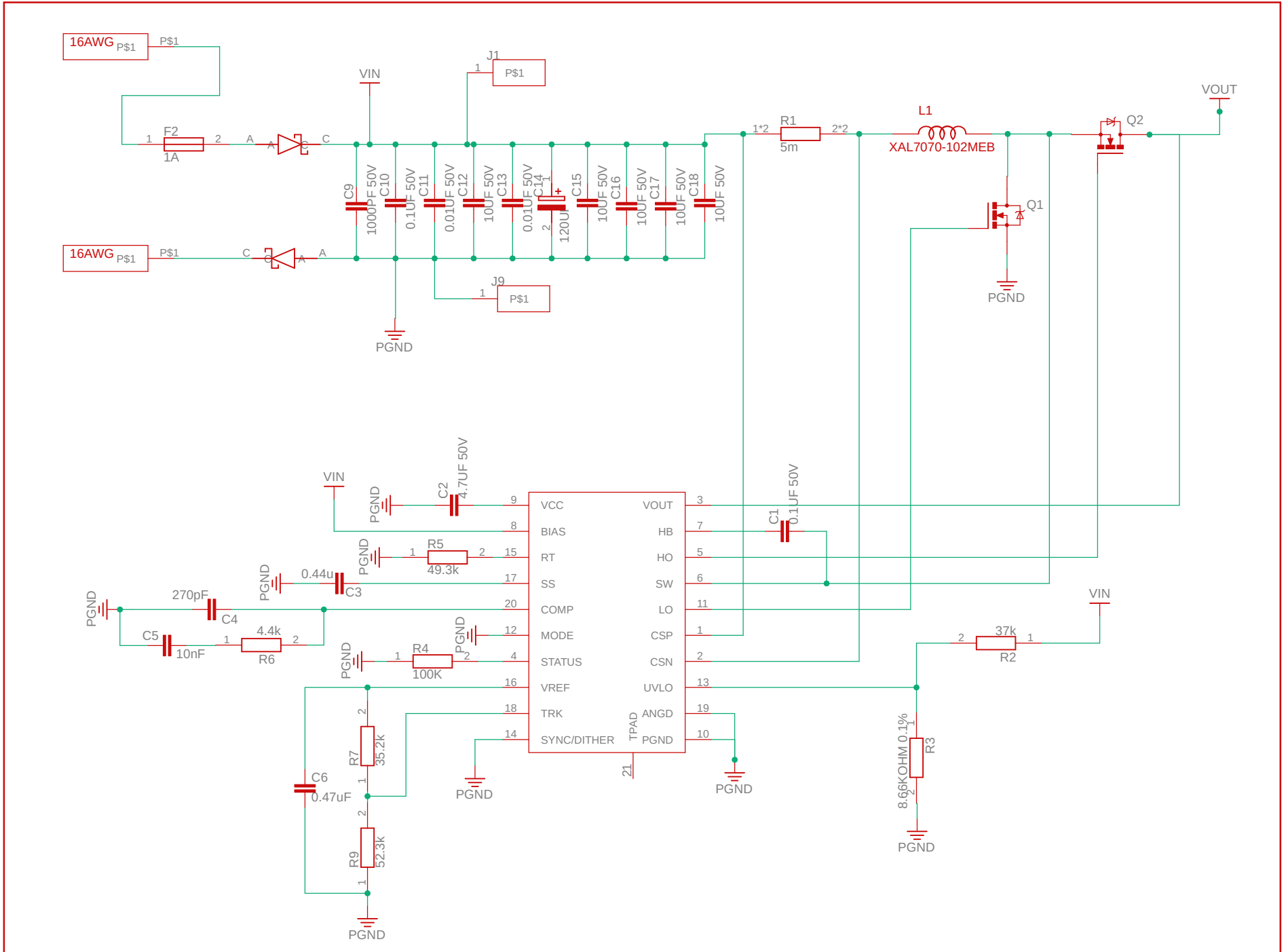
High-Side MOSFET Parameters (Q_H)

On-State Resistance, ($R_{DS(on)}$)	8.8 m Ω
Total Gate Charge, (Q_G)	10 nC
Gate-Drain Charge, (Q_{GD})	2.5 nC
Gate-Source Charge, (Q_{GS})	4.5 nC
Gate Resistance, (R_G)	2 Ω
Gate-Source Threshold Voltage, (V_{TH})	1.7 V
Body Diode Reverse Recovery Charge (Q_{RR})	19 nC
Body Diode Forward Voltage Drop (V_{D_BD})	0.85 V





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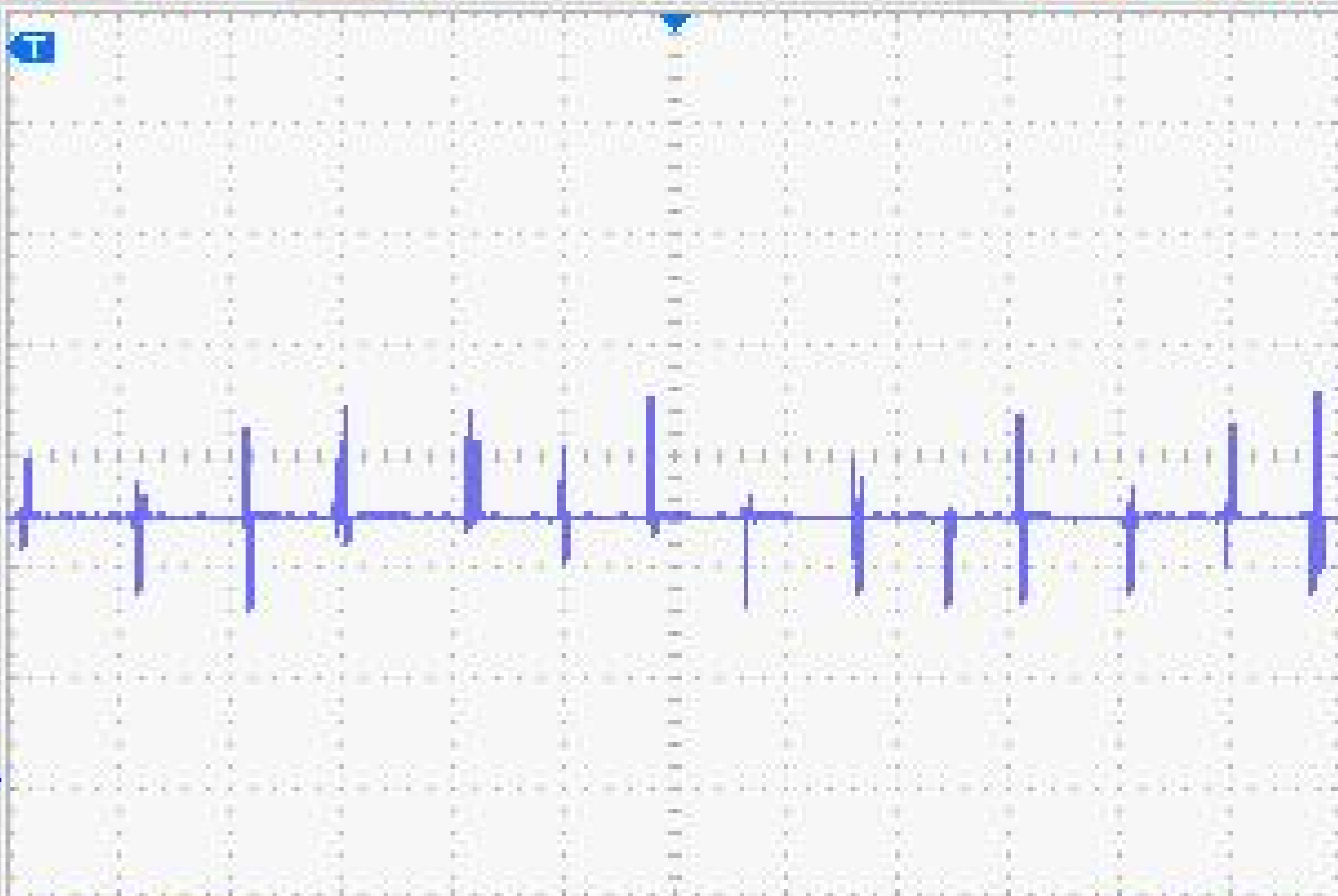
STOP



f



1.76U



5.00V

Time 1.000ms

20.40ms