[1,3] [2] [3] [3]

1. 213022 2. 65370 65
130163 3. 212003

Pspice

The parameter optimization and the experiment analyzes of main circiut of soft-switching inverter resistance spot welder

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Abstract: The inverter main circuit of resistance spot welder has been designed, Which is used of soft-switching techonolgy in this article.
Full-bridage main circuit structure is adopted as well as having saturated inductance. Making use of saturated inductance effect , which appears so big inductive reactances that the current keeps zero condition because of hindered breaking, when removing from saturation , which provide condition for the lagging legs cutting off under zero current state. Frequency effect is analsed in soft-switching inverter spot welder in detailed.The main circuit parameters are optimizd, through analysis using the theoretical calculation and lectric circuit simulation of Pspice .
By the analysis of the experiment we can conclude: the designed main circuit parameter is reasonable, the performance meets the designed requirements.

Keys: soft-switching resistance spot main circuit simulation

80

[1]

2

1

1 V_{in} Q_1~Q_4

IGBT D_1~D_4 Q_1~Q_4 C_1 C_2 Q_1 Q_2

C_b L_k T_r DR_1 DR_2 R

IGBT

C_b C_b

Q_1 Q_4 Q_2 Q_3 Q_1 Q_2 Q_3 Q_4

C_b

3

3.1

PWM

1.

2.

2KHz

3.2

ZCS C_b

n_{min}

$$n_{min} = \frac{NB_sL_e}{\mu I_f} \qquad (1)$$

N Bs Le μ

I_f

ONL 644020

S_e=1.68cm^2 L_e 1.63cm B_s

1.25T B_r=0.2T μ 2 × 10^{4}G$_s$/O$_e$

1500A 10

[3] I_f 150A 2

$$n_{min} = \frac{NB_sL_e}{\mu I_f} = \frac{100\times1.25\times16.3\times10^{-2}}{2\times4\pi\times10^{-3}\times150} \approx 5.7 \qquad (2)$$

n 6

L_s

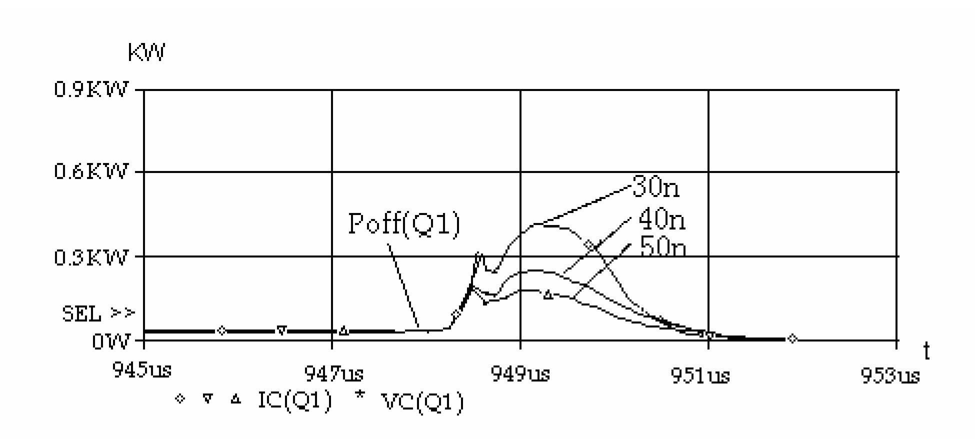
$$L_s = \mu n^2 \frac{S_e}{l_e} = 2\times6^2\times4\pi\times10^{-3}\frac{1.68\times10^{-2}}{16.3} \approx 9.32\times10^{-4}(H) \qquad (3)$$

3.3

IGBT

[3] Pspice 2

Poff Q_1 IGBT Q_1 50n



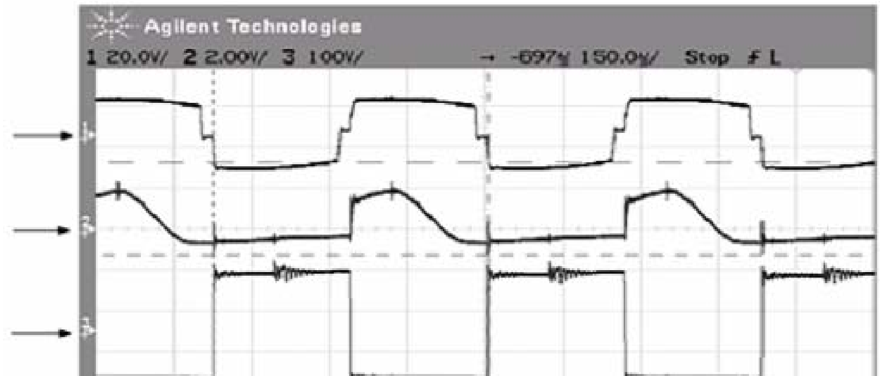
2 IGBT

Fig.2 Simulation waveform of the influence of IGBT's Shutdown loss Under electric capacity function in leading leg

4

2.7 Q_1

Q_1



Q_1 20V/

Q_1 2V/

Q_1 100V/

3 Q_1 Q_1

Fig.3driving signal of Q_1, V_{CE} of Q1 and current waveform

2.8 IGBT Q_4 Q_4

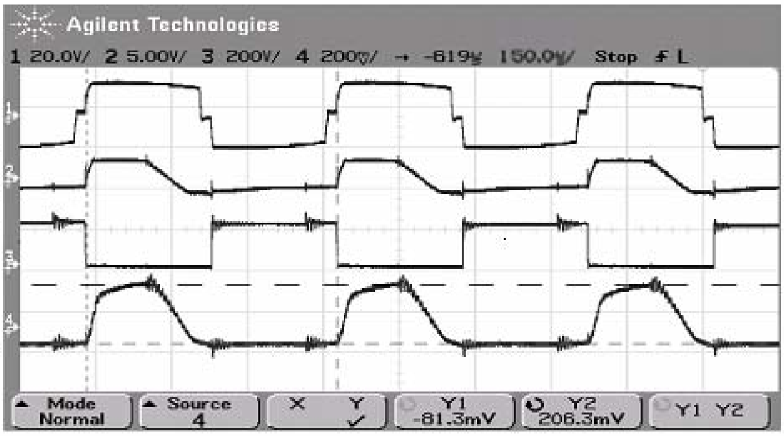
Q_4 Q_4

Q_4 20V/

Q_4 5V/

Q_4 200V/

i_p 20V/



4 Q_4 Q_4

Fig.4 driving signal of Q_4, V_{CE} of Q4 and current waveform

5

1

2

3

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