



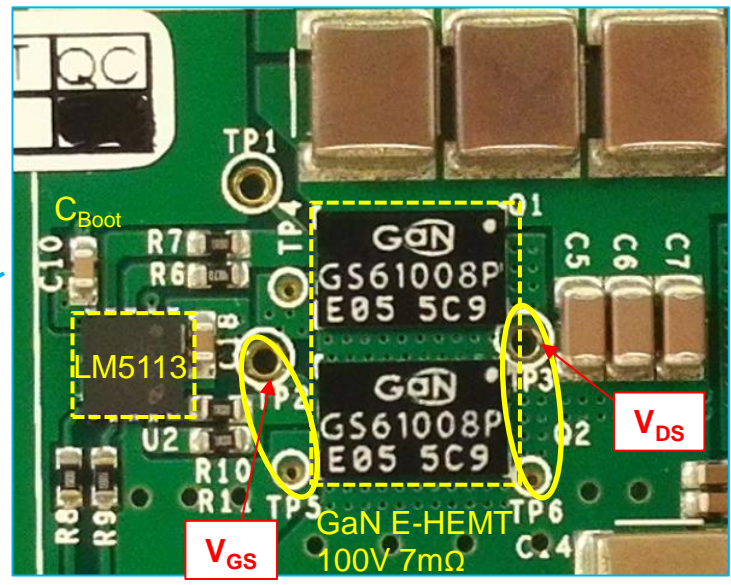
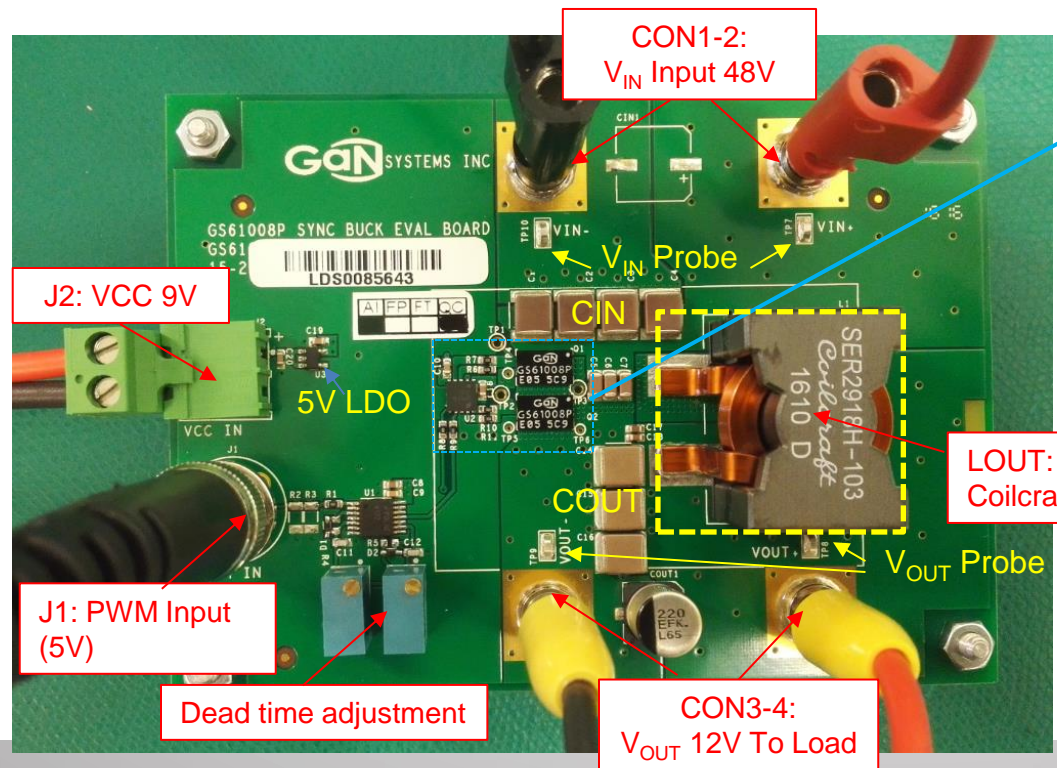
# 48V Sync Buck DC/DC Demo Board User Guide

Rev. 2016-06-07

GaN Systems Confidential

# GS61008P Sync Buck demo board

- Universal GaN half bridge with open loop control
- On-board PWM dead time generation
- For 48V-12V Sync Buck DC/DC evaluation
- 100V/90A 7mohm GaN E-HEMT (GS61008P)

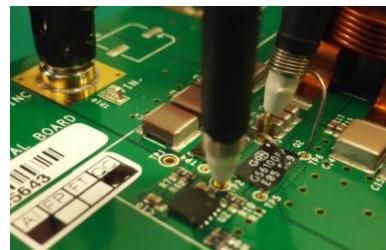
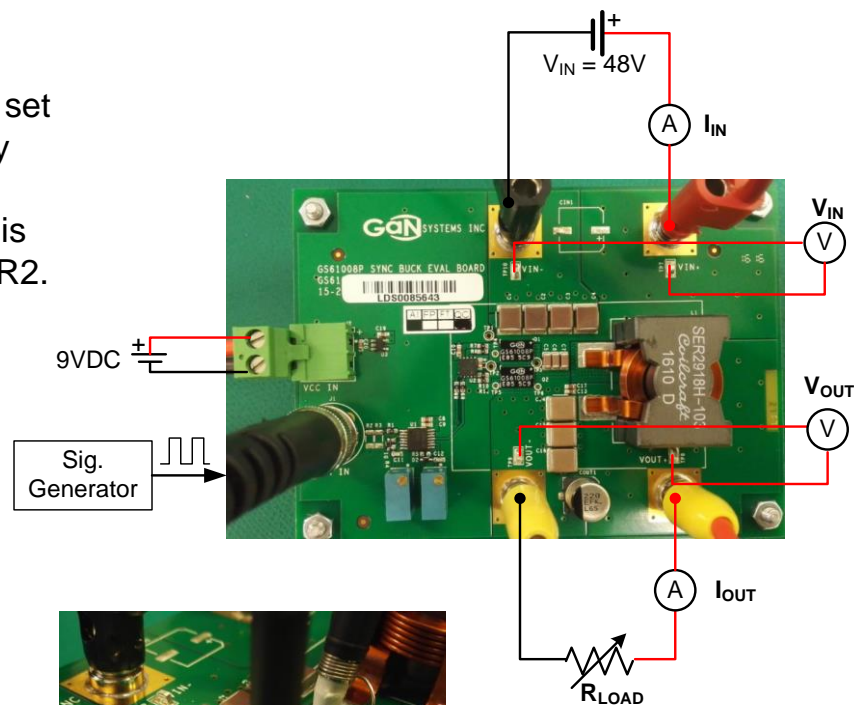


LOUT: Univ. footprints for Coilcraft SER2000/2900 series

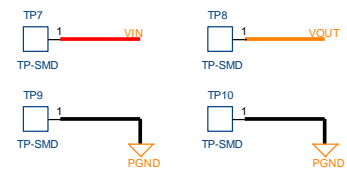
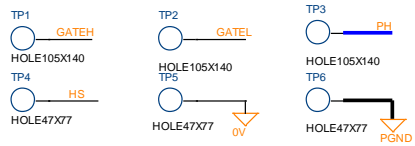
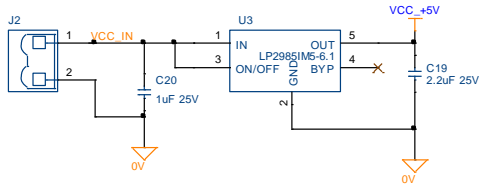
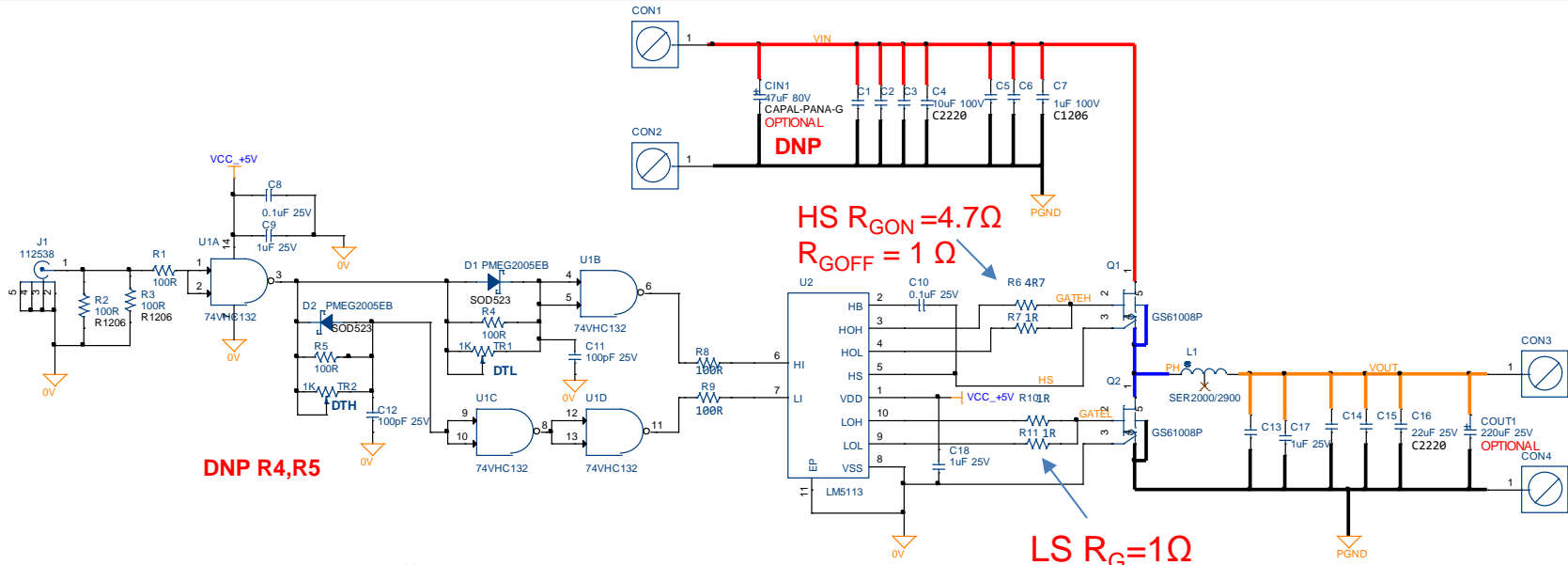


## Test procedure for 48-12V open loop sync buck DC/DC

1. Apply 9VDC to J2
2. Apply PWM signal (0-5V) to J1. If a signal generator is used, set to Hi-Z output mode. Start with 25% duty cycle and frequency 300kHz.
3. Monitor high/low side gate signals and ensure the dead time is around 15-20ns. If needed adjust dead time by tuning TR1/TR2.
4. For efficiency measurement, add current meter and use TP7/TP10 for VIN and TP8/TP9 for VOUT measurement.
5. Connect load to CON3(VOUT+) and CON4(VOUT-)
6. Apply 48VDC to CON1(VIN+) and CON2 (VIN-)
7. Adjust duty cycle, frequency and load current, monitor the efficiency and device temperature.
8. After testing, turn off 48VDC VIN first, then PWM signal and 9VDC last.



Voltage probing



- $V_{IN}=48V$ ,  $V_{OUT}=12V$ ,  $F_{SW}=300K$ - $1MHz$
- $L=10\mu H$  (SER2918-103KL)
- $I_{OUT}=0-12A / 20A$  (300kHz)
- $T_{AMB}=25^{\circ}C$ , forced air cooling (200 LFM)

## $F_{SW}=300kHz$ :

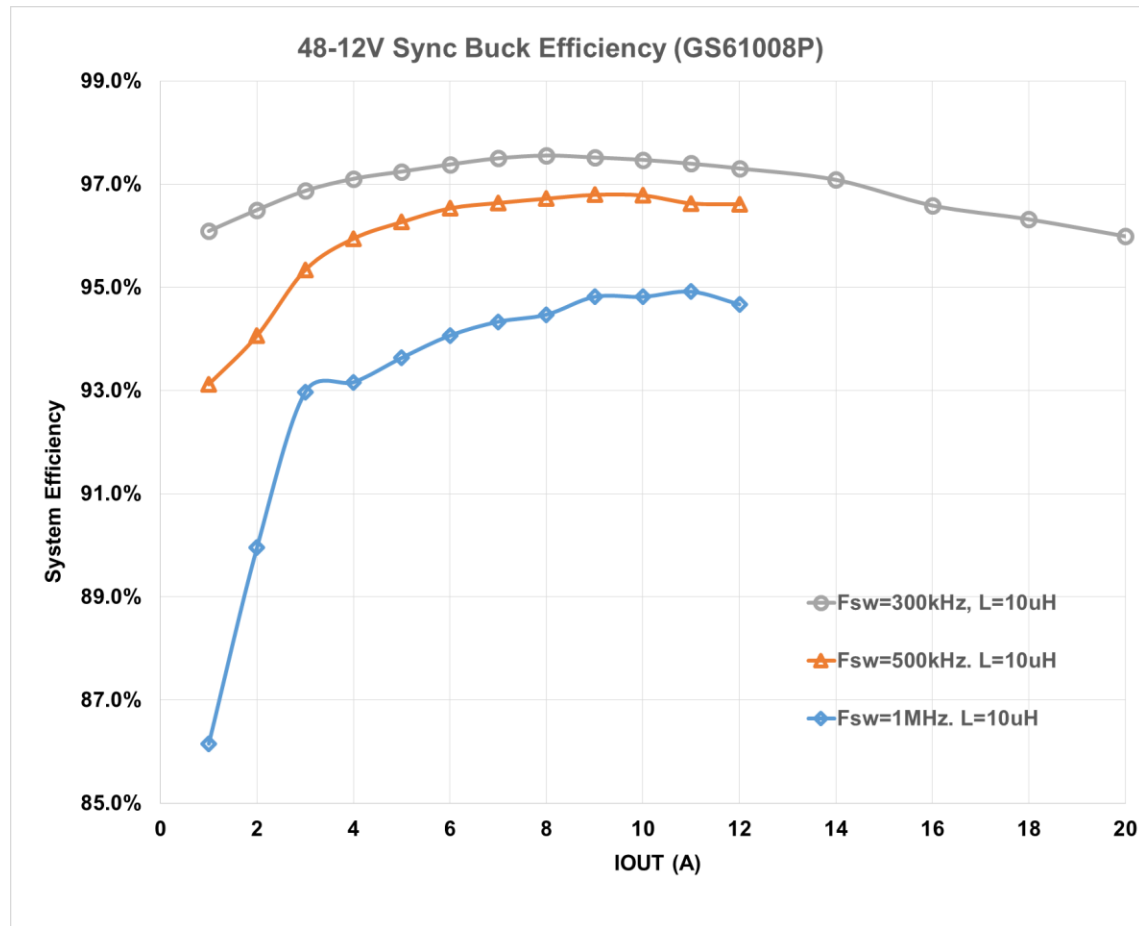
- **97.6%** Peak efficiency @  $I_{OUT}=8A$
- **96%** Full load efficiency @  $I_{OUT}=20A$ ,  $T_{JMAX} = 100^{\circ}C$

## $F_{SW}=500kHz$ :

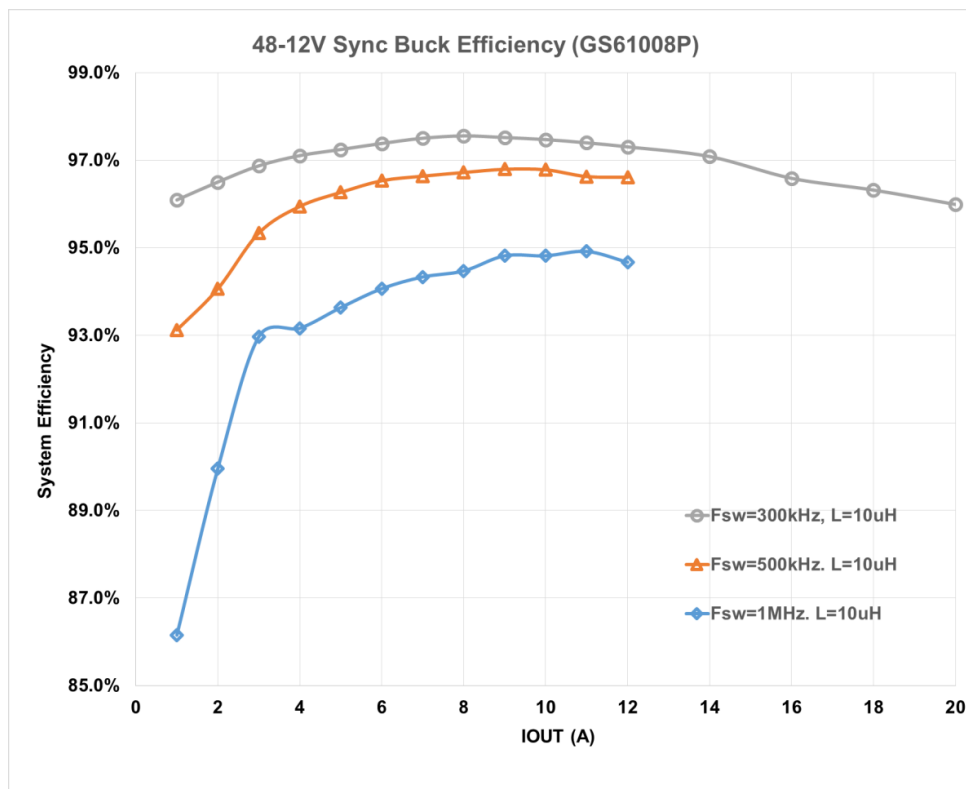
- **96.8%** Peak efficiency @  $I_{OUT}=10A$

## $F_{SW}=1MHz$ :

- **95%** peak efficiency @  $I_{OUT}=11A$
- $T_{JMAX} = 100^{\circ}C$  at 10A



- 100V GS61008P Matches TI 80V GaN half bridge performance at 1MHz (95% peak)
- Significant efficiency improvement over Si MOSFET



## Efficiency improvements compared to Si

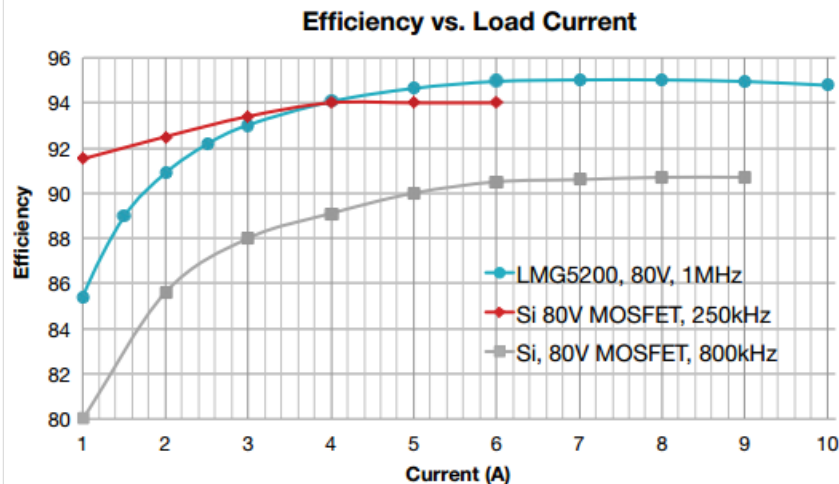
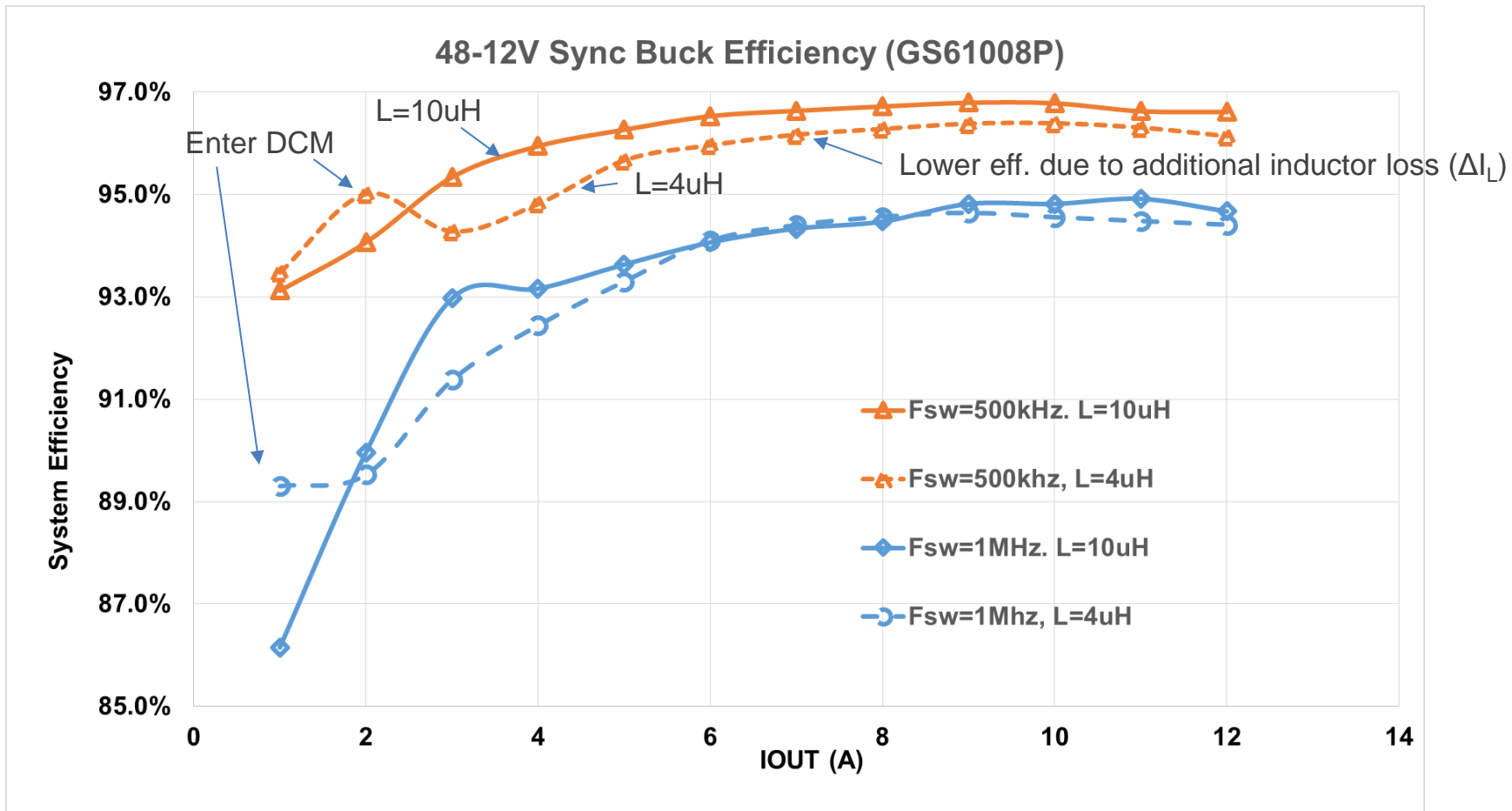
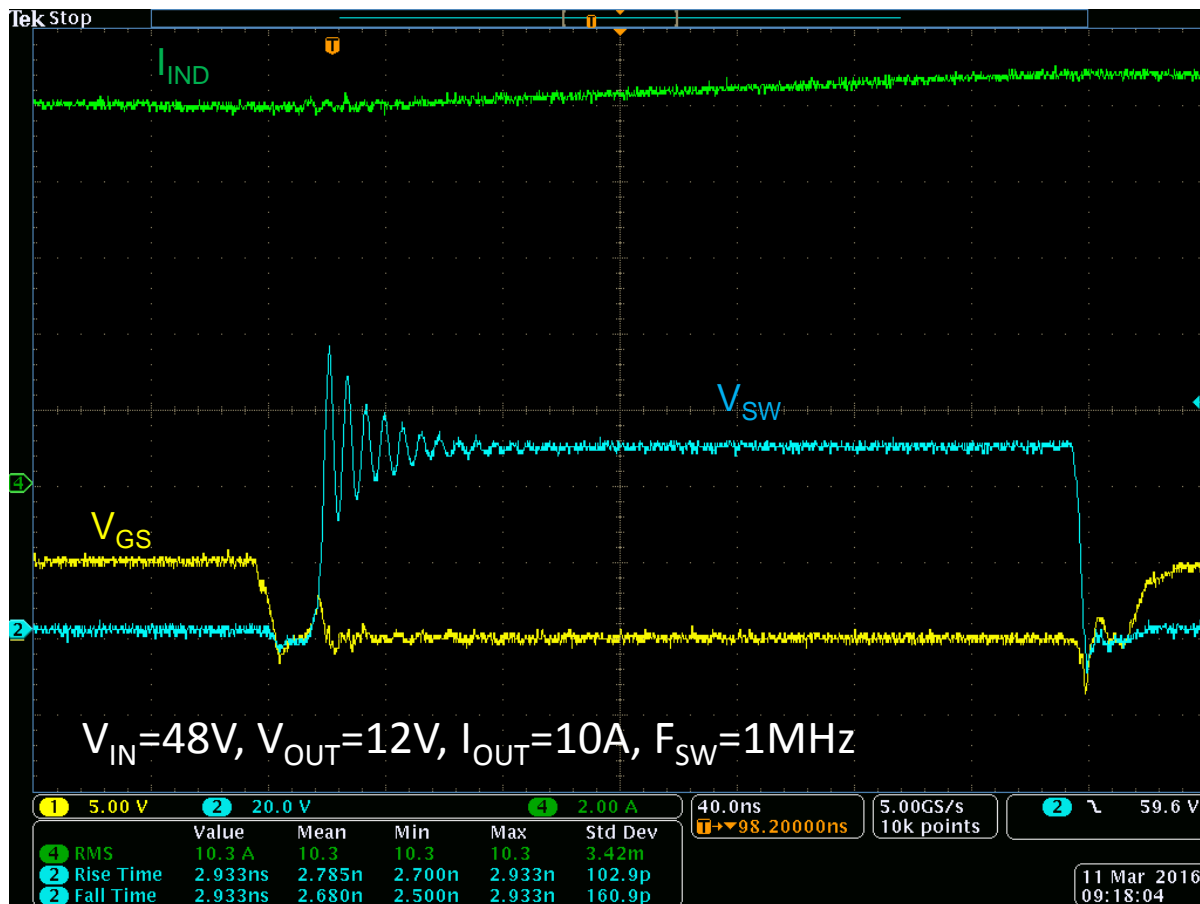


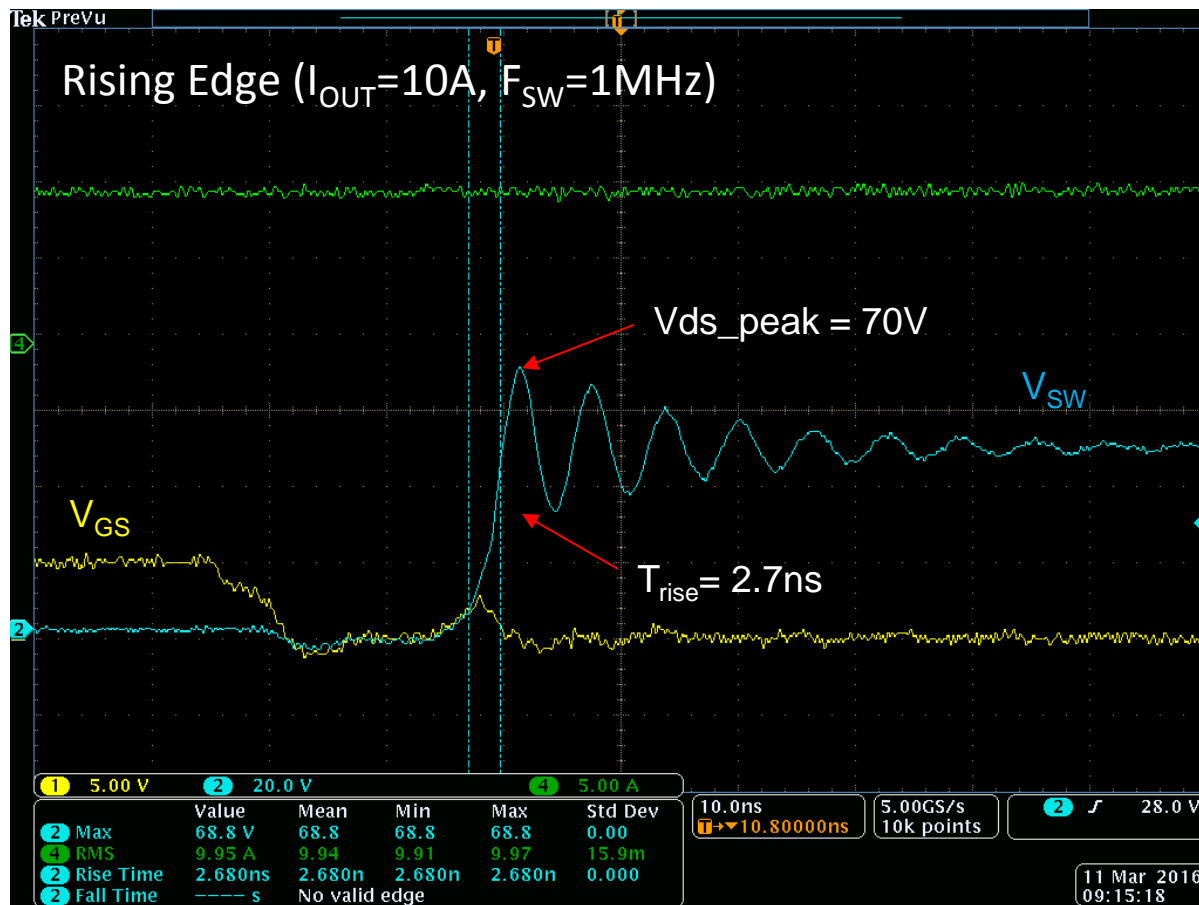
Figure 5. LMG5200 vs Si at different frequencies

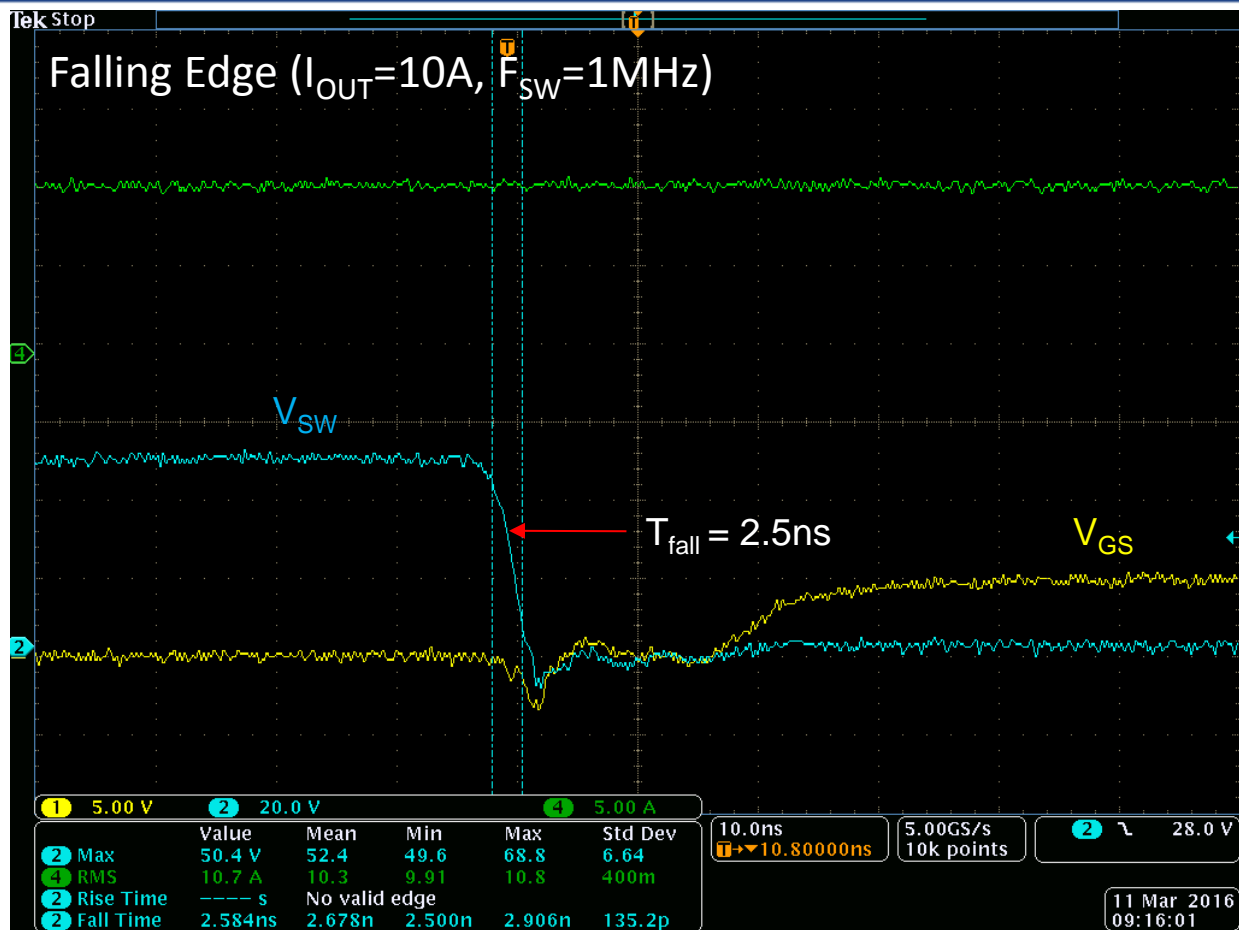
Efficiency between TI GaN FET LMG5200 48:12V Buck vs. 80V Si MOSFET  
Source: <http://www.ti.com/lit/wp/slyy071/slyy071.pdf>

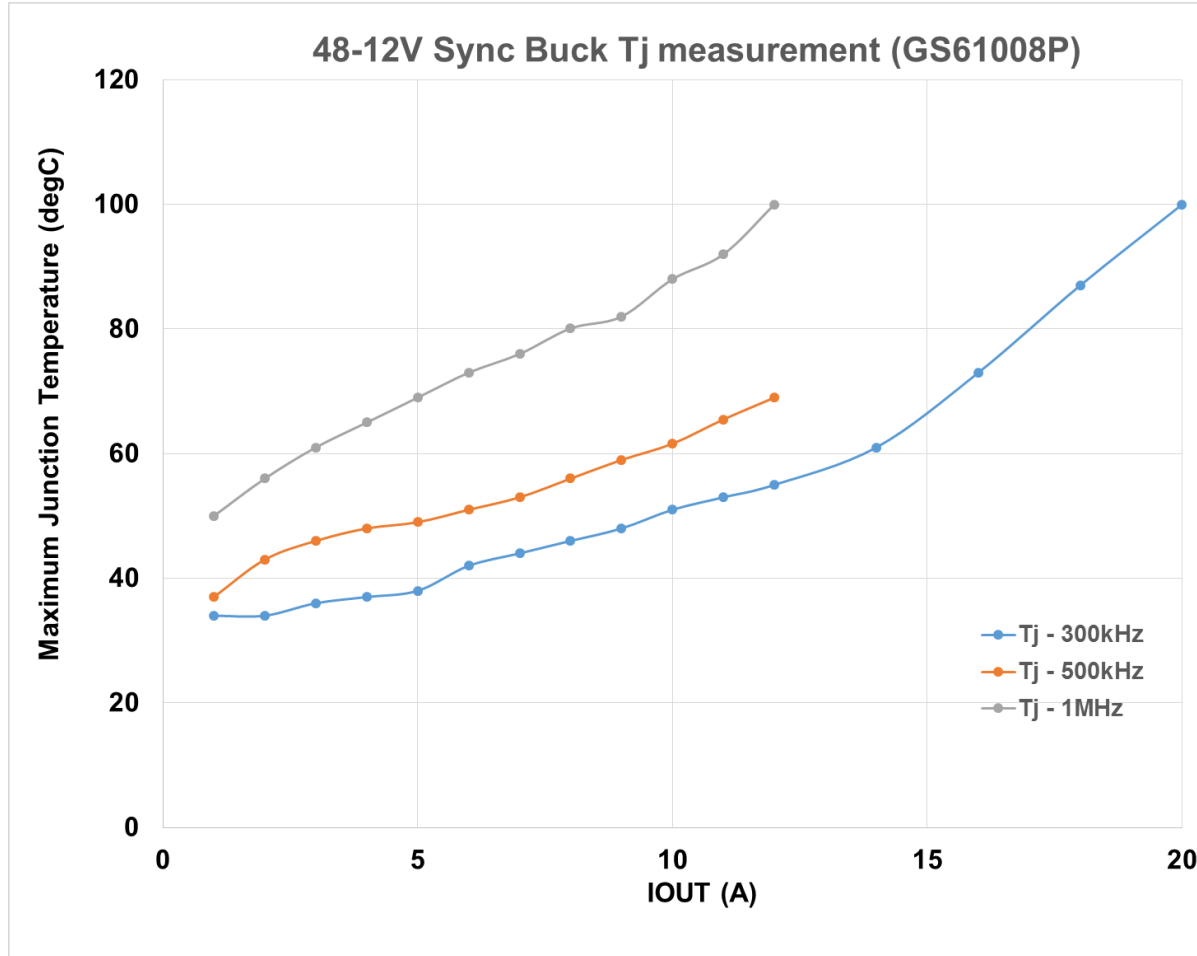








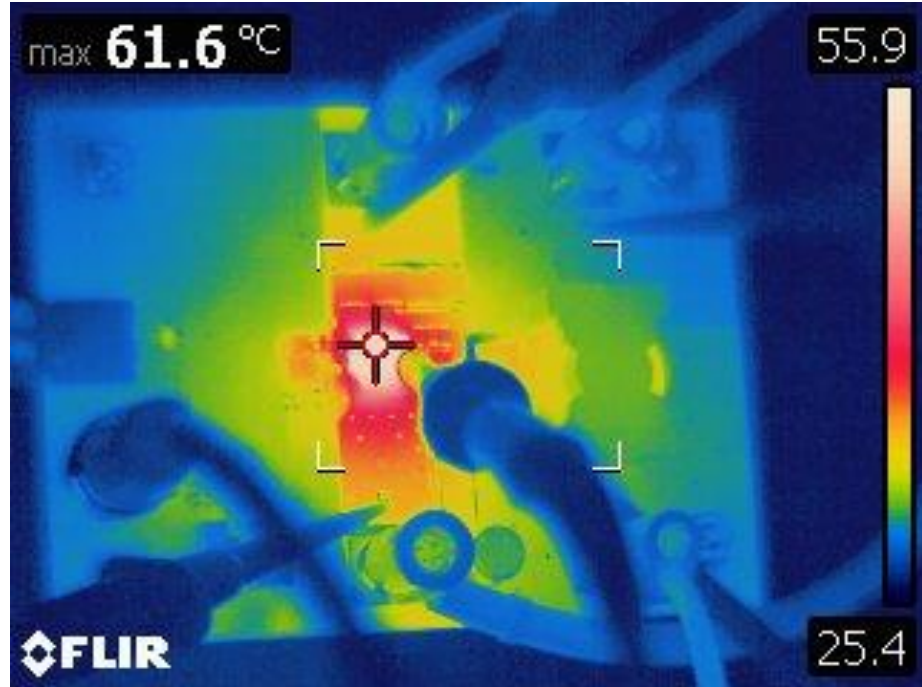




$T_{JMAX} = 91^{\circ}\text{C}$  ( $I_{OUT}=10\text{A}/1\text{MHz}$ ), L=SER2918H-103KL



$T_{JMAX} = 62^{\circ}\text{C}$  ( $I_{OUT}=10\text{A}$ ,  $F_{SW}=500\text{kHz}$ ), L=SER2918H-103KL



$I_{OUT}=5A$   
 $F_{sw}=300kHz$   
SER2014-402L



$I_{OUT}=10A$   
 $F_{sw}=300kHz$   
SER2014-402L



$I_{OUT}=15A$   
 $F_{sw}=300kHz$   
SER2014-402L



$I_{OUT}=20A$   
 $F_{sw}=300kHz$   
SER2014-402L





$T_{JMAX} = 91^{\circ}\text{C}$  ( $I_{OUT}=10\text{A}/1\text{MHz}$ )



$T_{JMAX} = 62^{\circ}\text{C}$  ( $I_{OUT}=10\text{A}$ ,  $F_{SW}=500\text{kHz}$ )

