OptiMOS™ 6 power MOSFET 60 V

design guideline

About this document

Scope and purpose

This application note introduce Infineon's OptiMOS™ 6 power MOSFET 60 V family and delves into their performance capabilities of the OptiMOS™ 6 power MOSFET 60 V, with a focus on high-speed DC-DC switch-mode power supplies (SMPS) used in telecom applications.

The document provides an overview of the technology, highlighting its technical advantages, followed by an in-depth experimental evaluation comparing the OptiMOS™ 6 60 V to its predecessor, the OptiMOS™ 5 power MOSFET 60 V.

Intended audience

The intended audiences for this document are design engineers, technicians, and developers of electronic systems.

Key points

- Compares OptiMOS™ 6 and OptiMOS™ 5 MOSFET technologies for efficiency, thermal performance, and switching behavior in telecom/AI server applications
- Explains experimental setups including soft-switching ZSC converter and hard-switched full-bridge topology with RC-snubber implementation
- Demonstrates design trade-offs between R_{Gon} adjustment and RC-snubber for minimizing ringing and switching losses
- Provides figure-of-merit analysis for $R_{DS(on)}$, gate charge, and output charge to guide device selection for high-frequency SMPS
- Highlights practical benefits such as reduced conduction losses, improved efficiency, and lower thermal stress for high-power designs

About this product family

Product family

Infineon's OptiMOS™ power MOSFETs provide best-in-class performance with increase in efficiency, power density, and cost-effectiveness. With ultra-low $R_{DS(on)}$ as well as low charge for high switching frequency they are ideally suited for a variety of applications.

Target applications

- DC-DC converters
- Static switches
- Server power supply units (PSU)
- Telecommunications infrastructure
- Battery management systems (BMS)

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1 Introduction to OptiMOS™ 6 power MOSFET 60 V

OptiMOS™ 6 power MOSFET 60 V is the latest Silicon technology, designed for high-current applications, such as in motor-drive and SMPS applications, by providing lowest $R_{DS(on)}$.

OptiMOS™ 6 power MOSFET 60 V family, leverages Infineon's cutting-edge trench MOSFET technology, which features a groundbreaking cell design. This generation of soft switching OptiMOS™ 6 power MOSFET 60 V combines exceptional on-state resistance and outstanding switching performance. This unique blend of features makes the OptiMOS™ 6 power MOSFET 60 V an ideal choice for soft switching high power applications, supporting the industry trend towards higher efficiency, increased power density, and reduced costs.

The soft switching OptiMOS™ 6 power MOSFET 60 V is designed to excel in a range of applications, such as telecommunications, server and datacom systems, and other battery-powered devices.

1.1 OptiMOS™ 6 power MOSFET 60 V product portfolio

OptiMOS™ 6 power MOSFET 60 V comes in a wide $R_{DS(on)}$ range and different packages. With a wide range of options, the portfolio empowers system designers to optimize their designs with greater precision and to the fine-grained $R_{DS(on)}$ values, enabling them to target a vast array of applications.

Table 1 OptiMOS™ 6 power MOSFET 60 V portfolio

Package	Product	$R_{DS(on)}$, max. (mΩ) VGS = 10 V	Level Typ
	ISC007N06LM6	0.7	Logic Level
	ISC007N06NM6	0.75	Normal Level
	ISC008N06LM6	0.8	Logic Level
	ISC009N06NM6	0.9	Normal Level
	ISC025N06LM6	2.5	Logic Level
	ISC060N06NM6	6	Normal Level
	ISC009N06NM6SC	0.9	Normal Level
	ISZ023N06LM6	2.3	Logic Level
	ISZ025N06NM6	2.5	Normal Level
	ISZ072N06NM6	7.2	Normal Level
	IQE018N06NM6	1.8	Normal Level
	IQE018N06NM6CG	1.8	Normal Level
	IQE018N06NM6SC	1.8	Normal Level
	IQE018N06NM6CGSC	1.8	Normal Level

1.2 Key features

- Lower conduction losses ~40% lower $R_{DS(on)}$ when compared to OptiMOS™ 5 power MOSFET
- Cost savings from cooling systems and use of less expensive printed circuit material (PCB) material
- High power density enables a reduction in the number of paralleled MOSFETs, resulting in lower bill of materials (BOM) costs

1.3 Comparison between OptiMOS™ 6 power MOSFET 60 V and OptiMOS™ 5 power MOSFET 60 V

In the following sections, the OptiMOS™ 6 power MOSFET 60 V technology is compared with its predecessor, OptiMOS™ 5 power MOSFET about the following:

- Single devices (i.e., with the minimum $R_{DS(on)}$) in the different families' portfolios
- The respective families by comparing the field of merits (FOMs) of the technologies
- Package types: PG-TDSON-8 and PG-TSON-8 packages

In the following table, a datasheet comparison is given for devices with OptiMOS™ 6 power MOSFET 60 V and OptiMOS™ 5 power MOSFET 60 V. Table 2 focuses on parameters that are most important for high-switching frequency SMPS, for high frequency switching, and synchronous rectification and for low voltage drives and battery powered applications.

1.3.1 OptiMOS™ 6 vs. OptiMOS™ 5 power MOSFETs 60 V for 3 mm x 3 mm package

Table 2 Comparison between OptiMOS™ 6 and OptiMOS™ 5 power MOSFETs 60 V

Specification	Symbol	Conditions	OptiMOS™ 6 IQE018N06NM6CGSC	OptiMOS™ 5 IQE030N06NM5CGSC	Unit
Max. on-state resistance	$R_{DS(on)}$	T_J = 25°C	1.8	3	mΩ
Thermal resistance, junction to case	R_{thJC}	Case bottom (typ./max.)	0.57/1.2	–/1.5	°C/W
Max. junction temperature	$T_{J,max}$	–	175	175	°C
Drain current	I_D	T_C = 25°C	181	132	A
	$I_{D,pulse}$	T_C = 25°C	724	528	A
Typ. charges	Q_{gs} Q_{gd} Q_g Q_{rr}	See footnote [1, 2]	12.7[1] 9.8[1] 43[1] 31	12.3[2] 6.8[2] 39[2] 26	nC
Typ. input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	2800	2900	pF
Typ. output capacitance	C_{oss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	1000	600	pF

[1] Value given for the conditions: V_{DD} = 30 V, I_D = 30 A, V_R = 30 V, I_F = 50 A.

[2] Value given for the conditions: V_{DD} = 30 V, I_D = 20 A, V_R = 30 V, I_F = 50 A.

Specification	Symbol	Conditions	OptiMOS™ 6 IQE018N06NM6CGSC	OptiMOS™ 5 IQE030N06NM5CGSC	Unit
Typ. reverse transfer capacitance	C_{rss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	53	37	pF
Typ. output charge	Q_{oss}	V_{GS} = 0 V, V_{DS} = 30 V	64	42	nC

1.3.1.1 On-state resistance ($R_{DS(on)}$)

OptiMOS™ 6 power MOSFET 60 V technology shows significant improvement in terms of specific on-state resistance ($R_{DS(on)}$), compared to the previous generation of OptiMOS™ 5 power MOSFET 60 V. The specific on-state resistance is an important parameter of the technology.

Figure 1 shows the comparison between the maximum on-state resistance, specified for a gate-to-source voltage V_{GS} = 10 V, provided in the datasheet of the OptiMOS™ families. The OptiMOS™ 6 power MOSFET 60 V, packaged in 3.3 mm x 3.3 mm, records a decrease of 40% in $R_{DS(on)}$ compared to the previous OptiMOS™ 5 power MOSFET 60 V technology.

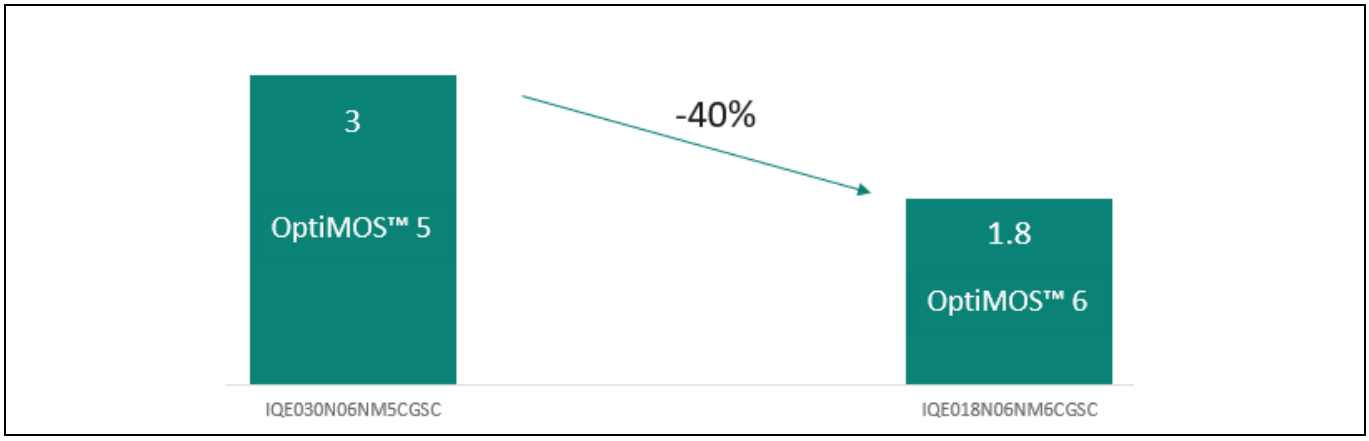


Figure 1 Comparison between the maximum on-state resistance (mΩ) for the OptiMOS™ 60 V MOSFETs

1.3.1.2 FOM_g and gate-to-drain charge figure-of-merit FOM_{gd} technologies

The reduction of the $R_{DS(on)}$ of OptiMOS™ 6 power MOSFET 60 V leads to an outstanding reduction of the FOM_g and FOM_{gd}.

Figure 2 shows the FOM_g improvement of 33% and also the FOM_{gd} improvement of 13% compared to the OptiMOS™ 5 power MOSFET 60 V.

- FOM_g represents a synthetic performance indicator of a technology and it is usually expressed as mΩ x nC. $R_{DS(on)}$ is a measure of the conduction losses
- Q_g impacts the driving losses and part of the switching losses, as it embeds Q_{gd}
- To minimize the total losses, both $R_{DS(on)}$ and Q_g need to be minimized: the lower the FOM the better, as this minimizes the product of both of these quantities

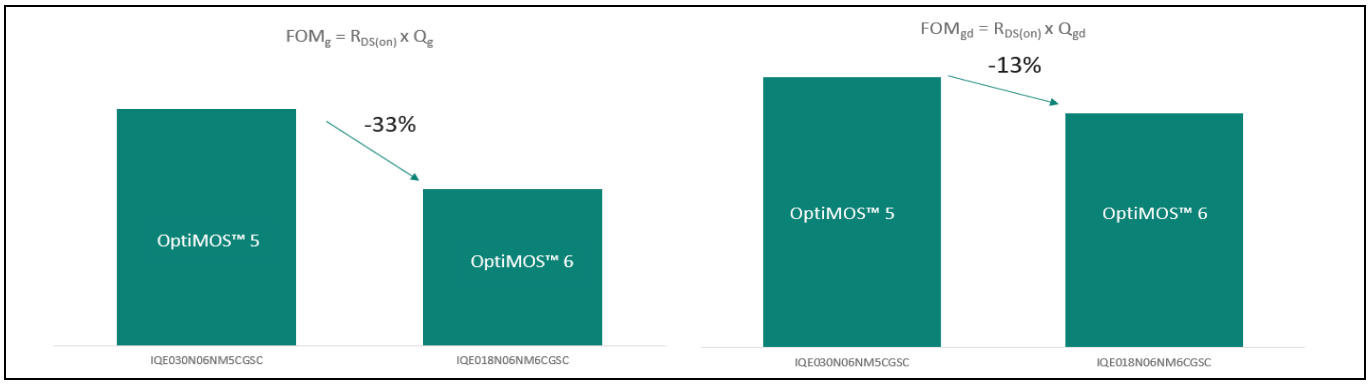


Figure 2 Comparison of gate charge and gate-to-drain charge FOM$_g$ and FOM$_{gd}$ for OptiMOS™ 5 and OptiMOS™ 6 power MOSFETs 60 V

1.3.1.3 Output charge figure-of-merit FOM$_{oss}$

The output capacitance of the MOSFET is charged in every switching cycle. Unfortunately, in hard-switched topologies, this stored energy is often lost and contributes to considerable turn-on losses, as it is dissipated through the channel during the MOSFET's turn-on phase.

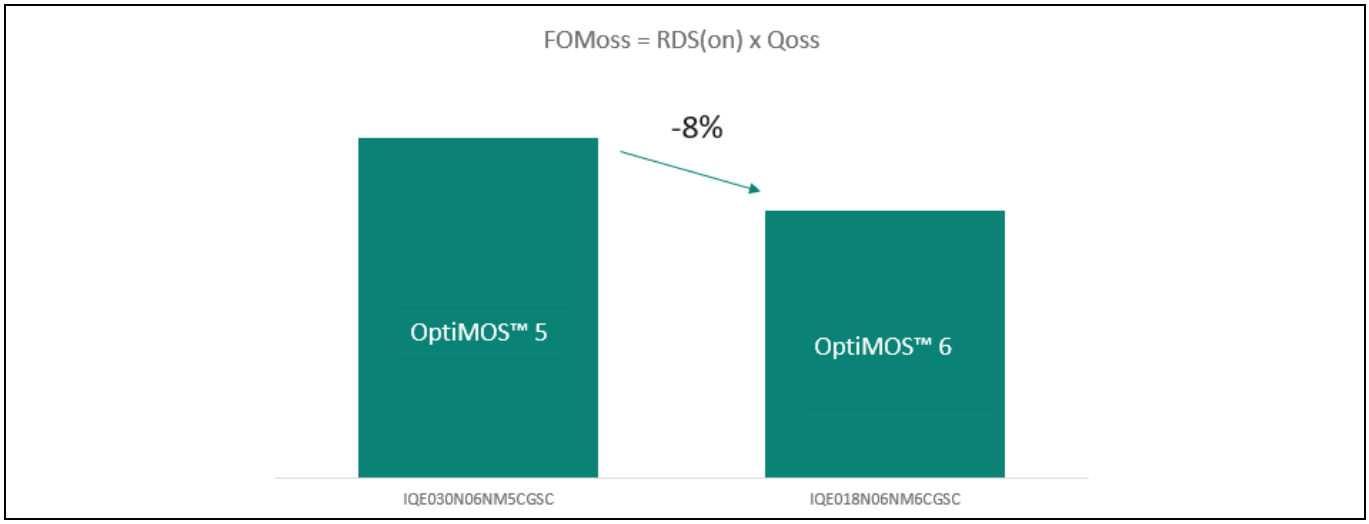


Figure 3 Comparison of output charge FOMOSS for the different technologies of 60 V MOSFETs

Similarly to the technology FOM$_g$, the output charge figure-of-merit FOM$_{oss}$ = $R_{DS(on)}$ x Q_{oss} represents a synthetic indicator of how well the technology behaves in conduction and switching. Losses associated with Q_{oss} are increasingly important at high drain voltages and scale linearly with the switching frequency. In Figure 3, the FOM$_{OSS}$ is plotted and shows an improvement of 8%.

The significant improvement in R$_{DSon}$ of the soft switching OptiMOS™ 6 power MOSFET leads to improvements in all FOM calculations.

1.3.1.4 OptiMOS™ 6 60 V hard & soft-switching operations

Soft-switching operation:

- The device features an exceptionally low $R_{DS(on)}$ value, which minimizes conduction losses and eliminates the need for gate voltage overdrive
- A gate drive voltage of 5 V to 7 V reduces switching losses, enables high-frequency operation, and improves gate oxide reliability, resulting in enhanced overall performance and longevity

Hard-switching operation:

- Focus on $FOMQ_{OSS}/Q_{g10}$ for optimized switching performance
- $R_{DS(on)10}$ improvement is well-balanced to the input and output capacitances to optimize $FOMQ_{oss}$ and $FOMQ_{g10}$
- Maintain Miller ratio < 0.8 for switching
- Ringing and overshoot behavior solution using an RC snubber (see Hard-switched commutation section)

2 Hard-switched commutation

2.1 Introduction

To comply with the IPC-9592 standard, it is recommended to implement either an RC snubber circuit or a gate resistor (RG) in hard-switching applications. This recommendation is attributed to the phenomenon of ringing and voltage overshoot, which can be mitigated through the implementation of such components, thereby ensuring compliance with the IPC-9592 standard. The OptiMOS™ 6 power MOSFET exhibits ringing behavior for hard-switching technologies. This can be remedied, for example, with an RC–snubber, which is provided in this section on how this can be implemented.

2.2 RC-snubber

The use of a snubber in a half-bridge reduces commutation losses by smoothing the switching edges of voltage and current, converting the energy lost due to parasitic inductances. A snubber absorbs and dissipates the energy, dampening the hard-switching transients that cause losses. This reduces the losses that would otherwise occur during switching of the half-bridge switches.

The test conditions for capturing the waveforms are as follows: a Double Pulse setup is used, with V_{IN} = 30 V and I_{chk} = 50 A. For this comparison, OptiMOS™ 6 ISC009N06NM6 power MOSFETs is used.

Table 3 OptiMOS™ 6 power MOSFET 60 V

Specification	Symbol	Conditions	OptiMOS™ 6 ISC009N06NM6	Unit
Max. on-state resistance	$R_{DS(on)}$	T_J = 25°C	0.9	mΩ
Thermal resistance, junction to case	R_{thJC}	Case bottom (typ./max.)	0.34/0.68	°C/W
Drain current	I_D	T_C = 25°C	344	A
	$I_{D, pulse}$	T_C = 25°C	1376	A
Typ. charges	Q_{gs} Q_{gd} Q_g Q_{rr}	See notes[3]	28[3] 20[3] 97[3] 66[3]	nC
Typ. input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	6400	pF
Typ. output capacitance	C_{oss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	2200	pF
Typ. reverse transfer capacitance	C_{rss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	72	pF
Typ. output charge	Q_{oss}	V_{GS} = 0 V, V_{DS} = 30 V	137	nC

[3] Value given for the conditions: V_{DD} = 30 V, I_D = 50 A, V_R = 30 V, I_F = 50 A.

2.3 RC-snubber calculation

1. Measure the circuit's oscillation frequency f_0 (Figure 4 Waveform 1)

   The measured oscillation frequency f_0 = 57.87 MHz

2. Add a capacitor C_1 in parallel with the switch and measure the shifted oscillation frequency f_1. Select a capacitor value that is several times larger than the switch state typical capacitor at full reverse voltage in the datasheet (C_1 = 680 pF)

   The measured shifted oscillation frequency f_1 = 52.083 MHz

3. Frequency shift ratio:

$$m = \frac{f_0}{f_1} = \frac{57.87MHz}{52.083MHz} = 1.111$$

Equation 1 Frequency shift ratio

4. Circuit's parasitic capacitance:

$$C_0 = \frac{C_1}{m^2-1} = \frac{680pF}{1.111^2-1} = 2.899nF$$

Equation 2 Circuit's parasitic capacitance

5. Circuit's parasitic inductance:

$$L = \frac{m^2-1}{(2\cdot\pi\cdot f_0)^2\cdot C_1} = \frac{1.111^2-1}{(2\cdot\pi\cdot 57.87MHz)^2\cdot 680pF} = 2.609nH$$

Equation 3 Circuit's parasitic inductance

6. Starting snubber values:

$$R_{snubber} = \sqrt{\frac{L}{C_0}} = \sqrt{\frac{2.609nH}{2.899nF}} = 0.949\Omega$$

Equation 4 Starting snubber resistor value

$$C_{snubber} = 2 \cdot C_0 = 2 \cdot 2.609nF = 5.218nF$$

Equation 5 Starting snubber capacitor value

Table 4 RC-snubber values

	Calculated value	Chosen value
$R_{snubber}$	0.949Ω	1Ω
$C_{snubber}$	$5.218nF$	$3.3nF$

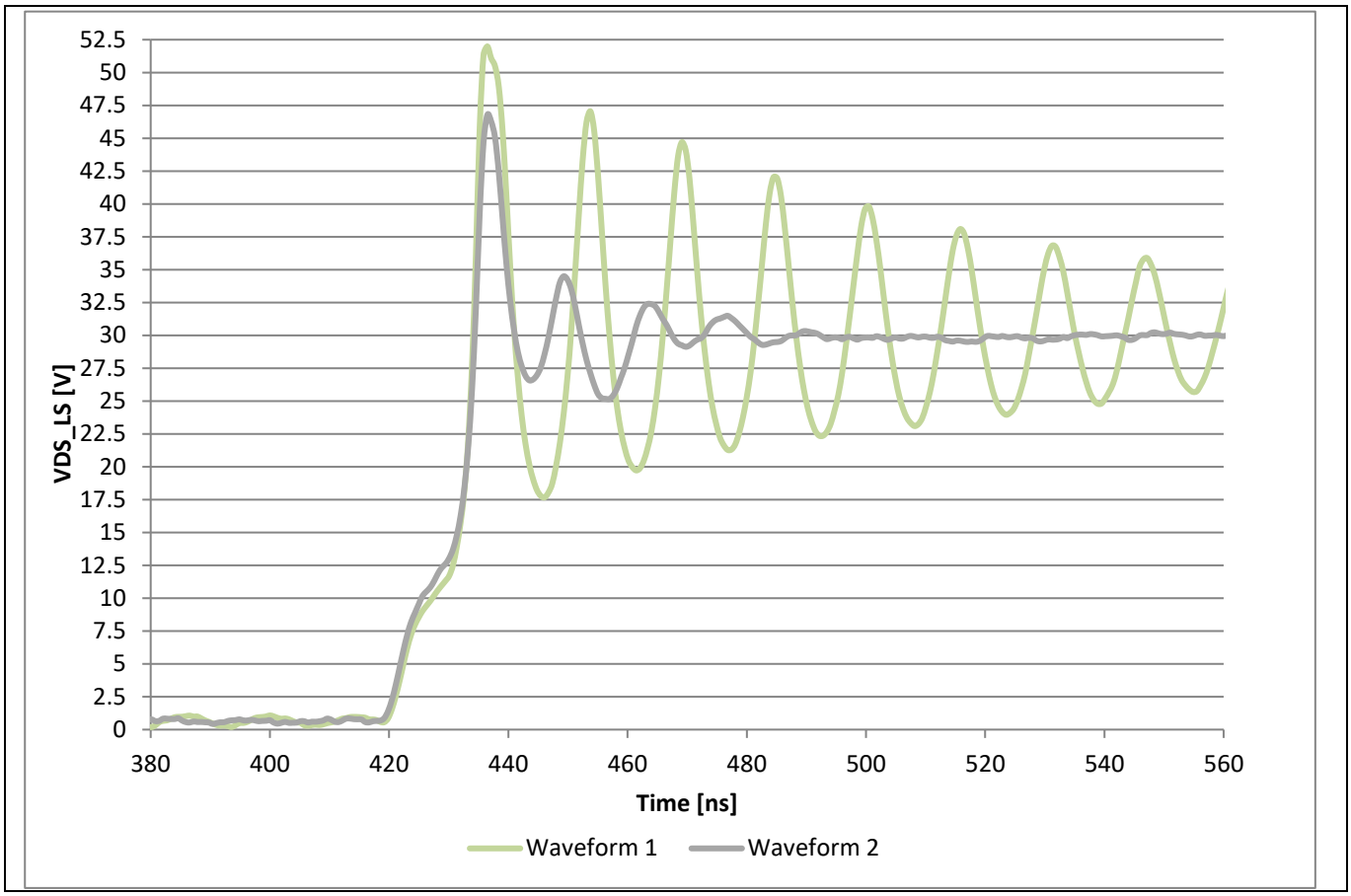


Figure 4 Waveform RC-snubber calculation

Figure 4 shows that with the calculated RC-snubber values applied, the OptiMOS™ 6 power MOSFET achieves a clean V_{DS} waveform (Waveform 2).

It is possible to adjust the ringing higher or lower by varying the C_{snub} value. Larger values for C_{snub} reduce the voltage-spike amplitude further, but increase power loss in R_{snub}. Alternatively, you can decrease the power dissipation in R_{snub} by lowering C_{snub}, but ringing will increase. You must weigh the trade-off between acceptable voltage-ring amplitude and R_{snub} losses. Undamped ringing in switching converters can create excessive EMI and overstress components. A properly calculated RC-snubber can be instrumental in taming these issues.

2.4 R_G adjustment to reduce overshoot

An alternative method to adjust the waveform is to increase the R_{Gon}, which can help to reduce the overshoot, but not the entire ringing behavior. The ringing behavior is only minimized. To maintain compliance with the IPC-9592 standard, it is recommended to incorporate a 4-ohm R_{Gon} resistor. The OptiMOS™ 6 power MOSFET requires a higher R_{Gon}, which makes an RC-snubber the preferred solution.

2.5 Switching energy and losses

Figure 5 shows the switching energy of the individual variants.

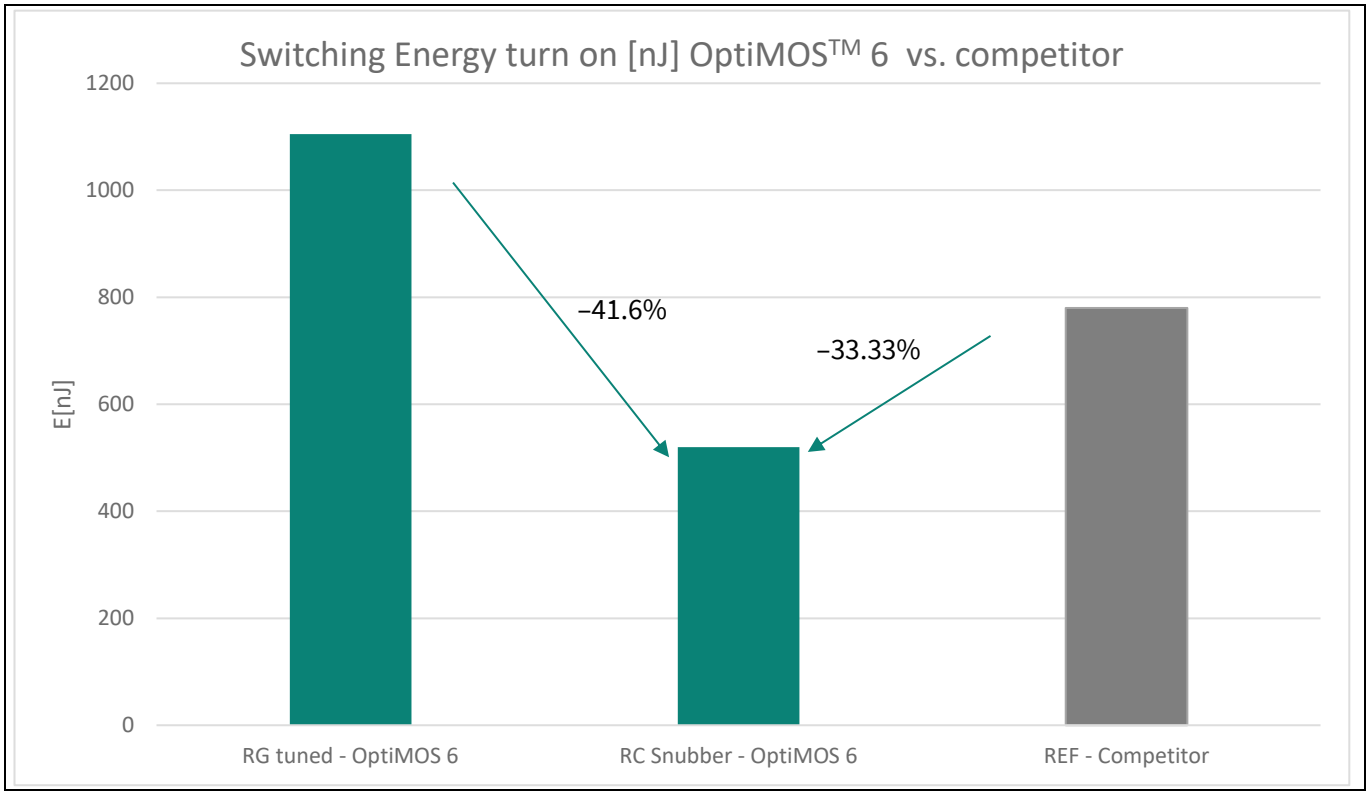


Figure 5 Switching energy turn on OptiMOS™ 5 vs. OptiMOS™ 6 power MOSFETs

As already mentioned in the RC-snubber section, the switching energy is increased with a higher R_{Gon} (Figure 5 RG tuned). If a RC-snubber is used instead, the switching energy is reduced (Figure 5 RC Snubber). A vendor sample with similar data sheet values was used for comparison. If you compare the RC-snubber OptiMOS™ 6 power MOSFET variant with a vendor sample, observe that the calculated RC-snubber and the improved $R_{DS(on)}$ of OptiMOS™ 6 power MOSFET also reduce the switching energy. Figure 5 shows the turn-on switching losses. The combination of the OptiMOS™ 6 power MOSFET variant and a RC-snubber enables a 33% reduction in switching losses. The RC-snubber variant offers a significant improvement over the R_{Gon} tuned variant, with switching losses reduced by 41%. As a result, choosing the right RC-snubber is essential to minimizing energy losses and optimizing overall system efficiency.

2.6 RC–snubber vs. R_{Gon} comparison

To summarize, the soft switched OptiMOS™ 6 power MOSFET with a reduced $R_{DS(on)}$ and the addition of an RC-snubber demonstrates a waveform curve which complies with the IPC-9592 standard. By using an RC-snubber instead of relying on a higher R_{Gon}, the switching energy and losses are substantially reduced, which in turn has a positive effect on the overall efficiency of the system. The soft switching OptiMOS™ 6 power MOSFET also supports hard switching topologies, enabled by the effective use of an RC-snubber, expanding its versatility and range of application possibilities.

Increasing the gate turn-on resistor R_{Gon} directly limits the peak gate current, thereby reducing dV_{DS}/dt and dI_D/dt during switching transitions. While this mitigates EMI and voltage overshoot from parasitic inductances (e.g., L_{stray} in PCB layout), it prolongs the MOSFET's time in the Miller plateau region increasing both turn-on (Eon) and turn-off (E_{off}) energy. For instance, doubling R_{Gon} can increase Esw by 30–50% in hard-switching topologies, directly impacting thermal design.

In contrast, an RC snubber typically connected drain-to-source provides targeted damping of high frequency ringing caused by L stray and C_{oss} resonance. The snubber capacitor (C_s) provides a low-impedance path for displacement current during fast dV_{DS}/dt events, limiting $V_{DS,peak}$ and reducing stress on the MOSFET's avalanche rating. The series resistor (R_s) critically damps the resonant peak and dissipates trapped energy. Unlike R_{Gon} tuning, an RC snubber suppresses ringing without slowing the main switching edge, preserving switching speed and minimizing Esw.

When paired with the OptiMOS™ 6 power MOSFET family featuring low $R_{DS(on)}$ (down to 0.7 mΩ), the RC snubber enables compliance with IPC-9592B voltage margin requirements (e.g., ≤80% of $V_{BR(DSS)}$) even under hard-switching conditions. This combination not only enhances system efficiency but also extends the usable operating envelope of soft-switching-optimized devices into hard-switching applications.

3 Test results

3.1 Soft-switching unregulated converter

3.1.1 System introduction

Infineon has developed a fully functional zero-voltage switching switched-capacitor (ZSC) converter evaluation unit, operating from an input voltage range of 60 V DC to 30 V DC. This is a highly efficient unregulated 2:1 soft switching converter. This converter demonstrates the advantages of the MOSFET under high-frequency conditions. The operation frequency is around 600 kHz. The dead-time must be set so that zero-voltage switching (ZVS) is achieved. Figure 6 shows the full ZSC board and Table 5 shows the board specifications.

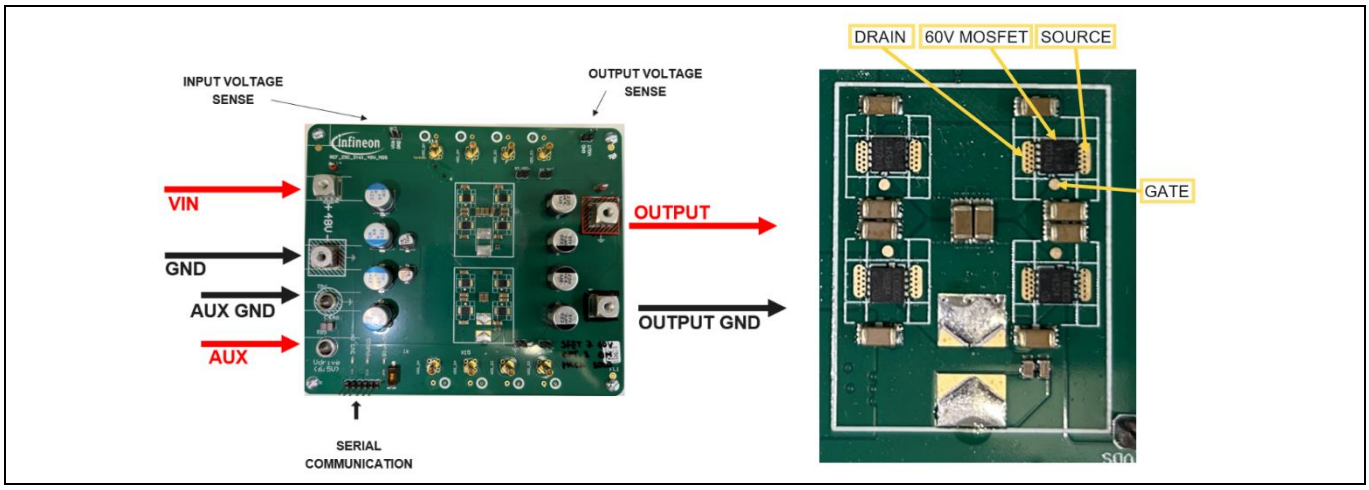


Figure 6 Zero-voltage switching switched capacitor board setup

Table 5 Specifications for the ZCS board

Parameter	Typ.	Unit
Input voltage	60	V
Gate drive voltage	8	V
Output voltage	30	V
Output current	Max. sample temp. 110°C	A
Switching frequency	600	kHz

3.1.2 Efficiency results

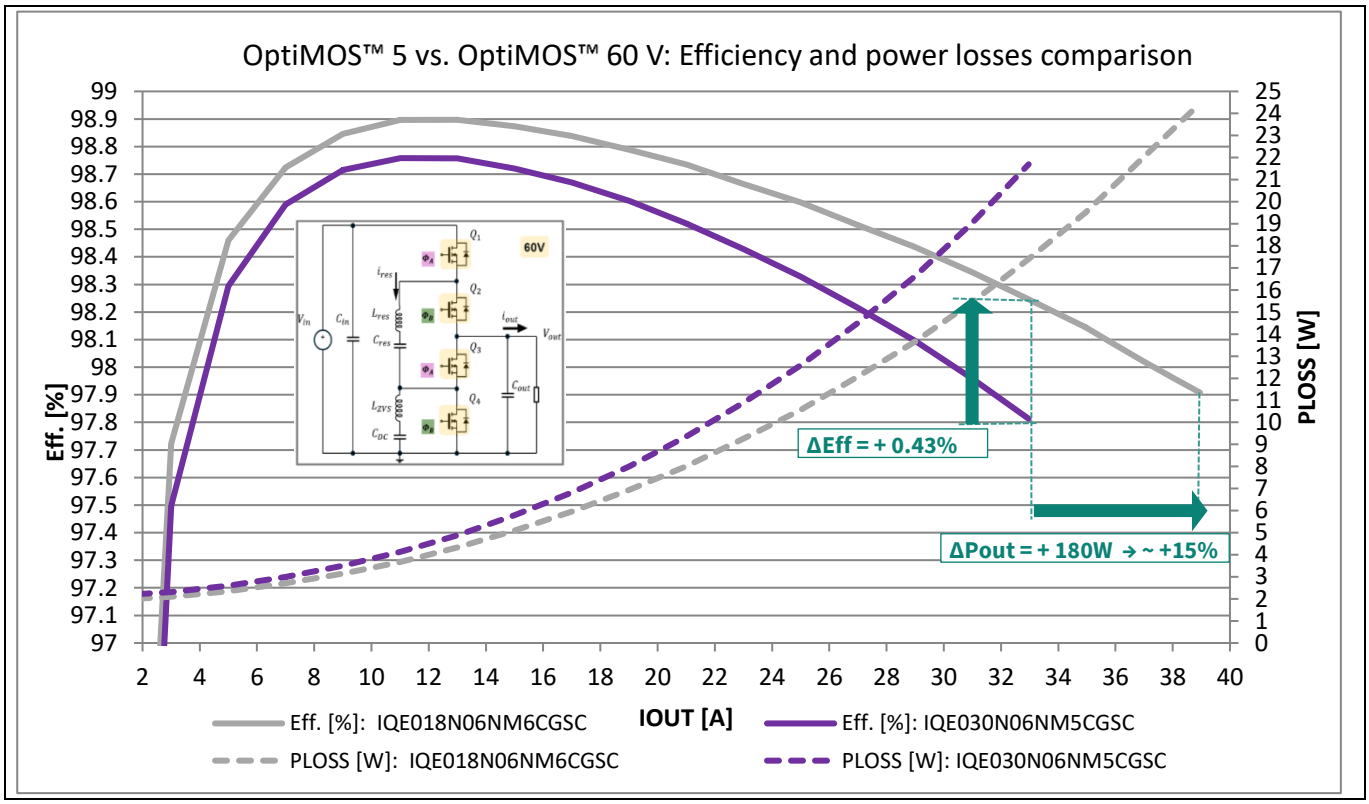


Figure 7 Efficiency and power loss results for OptiMOS™ 5 vs. OptiMOS™ 6 power MOSFETs

The measurement is started after a warm-up period of 10 minutes, during which the component temperature reached 110°C. The efficiency plot in Figure 7 shows that a valuable gain is obtained when using the Infineon soft switching OptiMOS™ 6 power MOSFET 60 V in a high-performance and high-switching frequency ZCS board. OptiMOS™ 6 power MOSFET shows an improvement of 15% that indicates a performance enhancement of 180 W.

Considering the maximum efficiency point of the OptiMOS™ 5 power MOSFET, an efficiency increases of 0.43% is achieved with the OptiMOS™ 6 power MOSFET. Furthermore, the power loss decreases around 4.29 W.

Improving system efficiency, the result of optimizations brought at product level, such as lower $R_{DS(on)}$ is a fundamental measure to keep the power density increasing. Furthermore, power losses could also be reduced, thereby lowering the component temperature. The soft switching OptiMOS™ 6 power MOSFET 60 V family enables the trend toward ultimate efficiency power conversion.

3.2 Hard-switched FB-FB SR

3.2.1 System description

This is a hard-switched full-bridge - full-bridge (FB-FB) topology. A heatsink and a fan are used to ensure optimal cooling of the brick board. The brick is plugged into a host board, which has a fan and all the necessary connectors, such as controller interface, V_{in}, V_{out}, and so on. Figure 8 shows the test setup and on the right-side the brick is mounted at the host board.

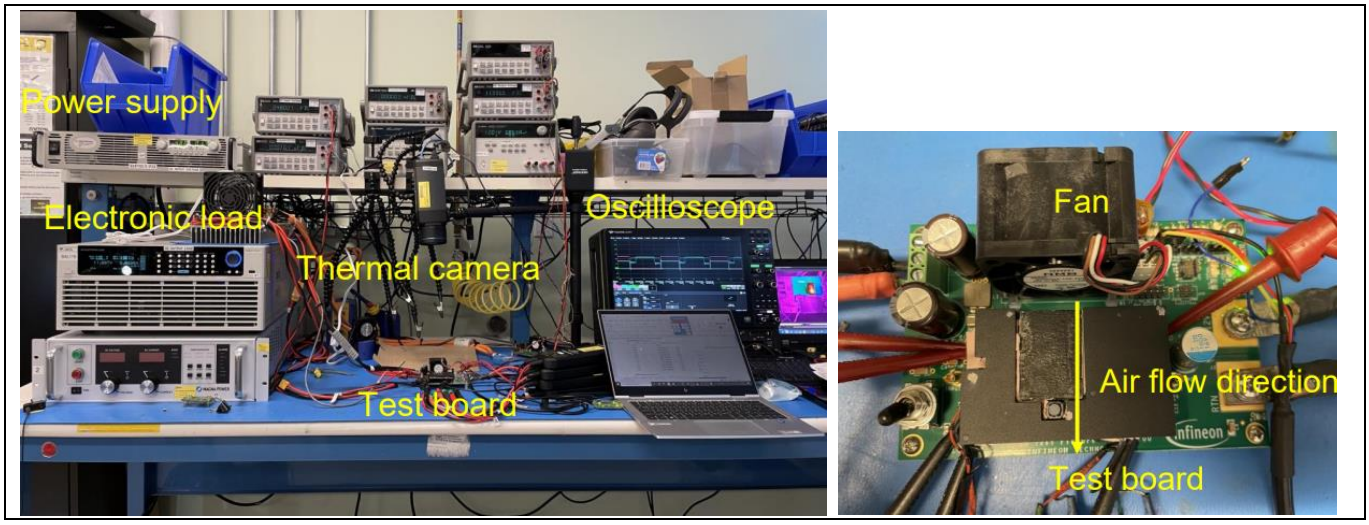
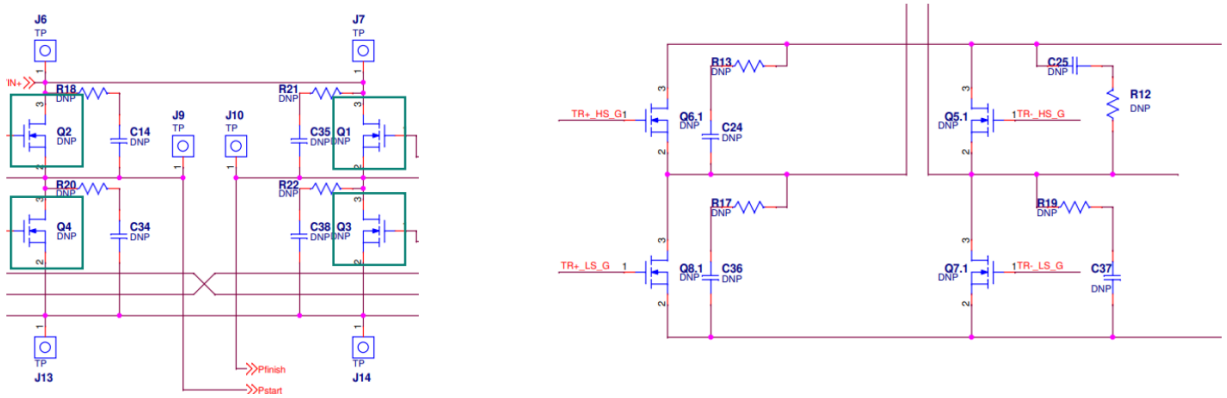


Figure 8 Hard-switched FB-FB setup



Primary side schematic

Primary side MOSFETs

ISC031N08NM6SC (OptiMOS™ 6 power MOSFET)

Secondary side schematic

Two MOSFETs are tested and compared on the secondary side

ISC009N06NM6SC (OptiMOS™ 6 power MOSFET)

BSC014N06NSSC (OptiMOS™ 5 power MOSFET)

Figure 9 Schematic hard switched FB-FB setup

Figure 9 shows the schematic of the primary and secondary sides. The configuration consisted of an OptiMOS™ 6 power MOSFET 80 V on the primary side from Infineon, with the secondary side used to evaluate and compare the performance of the OptiMOS™ 5 power MOSFET 60 V against the 60 V soft switched OptiMOS™ 6 power MOSFET.

OptiMOS™ 5 BSC014N06NSSC and OptiMOS™ 6 ISC009N06NM6SC are chosen as the devices of interest for this application test. Table 6 shows the important parameters.

Table 6 Parameter comparison between OptiMOS™ 5 and OptiMOS™ 6 power MOSFETs

Parameter	OptiMOS™ 6 ISC009N06NM6SC	OptiMOS™ 5 BSC014N06NSSC	Unit
$R_{DS(on)}$ typ./max.	0.71/0.9	1.2/1.4	mΩ
Qg typ.	97	89	nC
Coss typ.	2200	1500	pF

- OptiMOS™ 6 power MOSFET shows 41% lower $R_{DS(on)}$ typ. compared to OptiMOS™ 5 power MOSFET
- OptiMOS™ 6 power MOSFET shows 9% higher Qg compared to OptiMOS™ 5 power MOSFET
- OptiMOS™ 6 power MOSFET shows 9% higher Qg compared to OptiMOS™ 5 power MOSFET

3.2.2 Test setup parameters

Table 7 Test setup parameters

Parameter	Value	Unit
VIN	48	V
IOUT	70	A
Fsw	250	kHz
Max. power	840	W

A damping circuit, consisting of a 7.5-ohm resistor and a 1.5-nF capacitor, populates as an RC snubber to reduce the ringing behavior of the OptiMOS™ 6 power MOSFET.

3.2.3 Waveform results

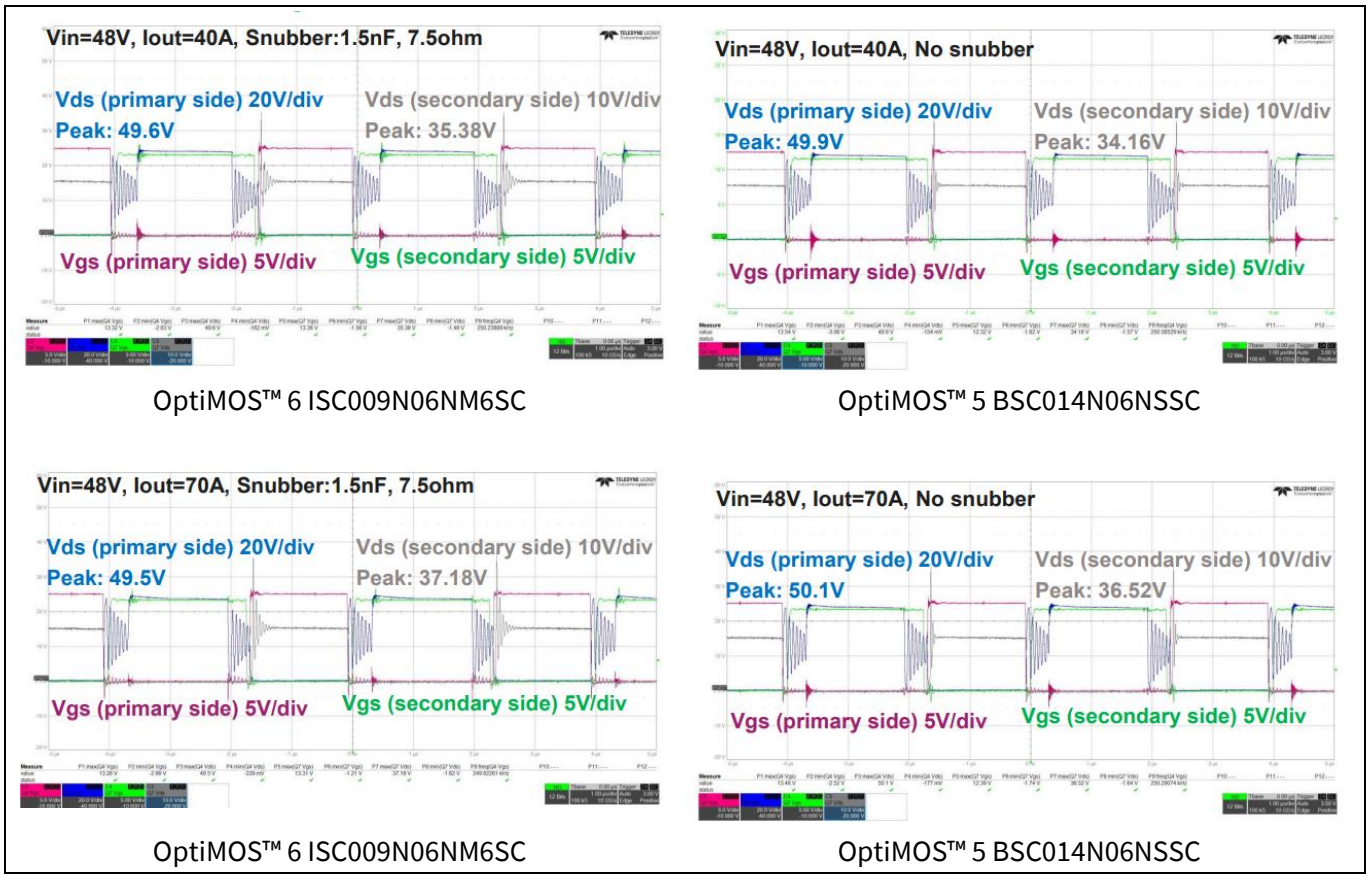


Figure 10 Waveform comparison between OptiMOS™ 5 and OptiMOS™ 6 power MOSFETs

As shown in Figure 10, the RC-snubber implemented on the OptiMOS™ 6 power MOSFET exhibits comparable ringing behavior to that of the OptiMOS™ 5 power MOSFET, with similar V_{DS} overshoot on the secondary side, confirming that the snubber calculation is accurate for this application. The measurements are repeated at two different operating points and the waveforms exhibited the same behavior, validating the results.

3.2.4 Efficiency

At full-load condition, OptiMOS™ 6 power MOSFET 60 V shows 0.51% higher efficiency at 840 W compared to OptiMOS™ 5 power MOSFET 60 V. Figure 11 shows the efficiency comparison at V_{in} = 48 V and I_{OUT} = 70 A.

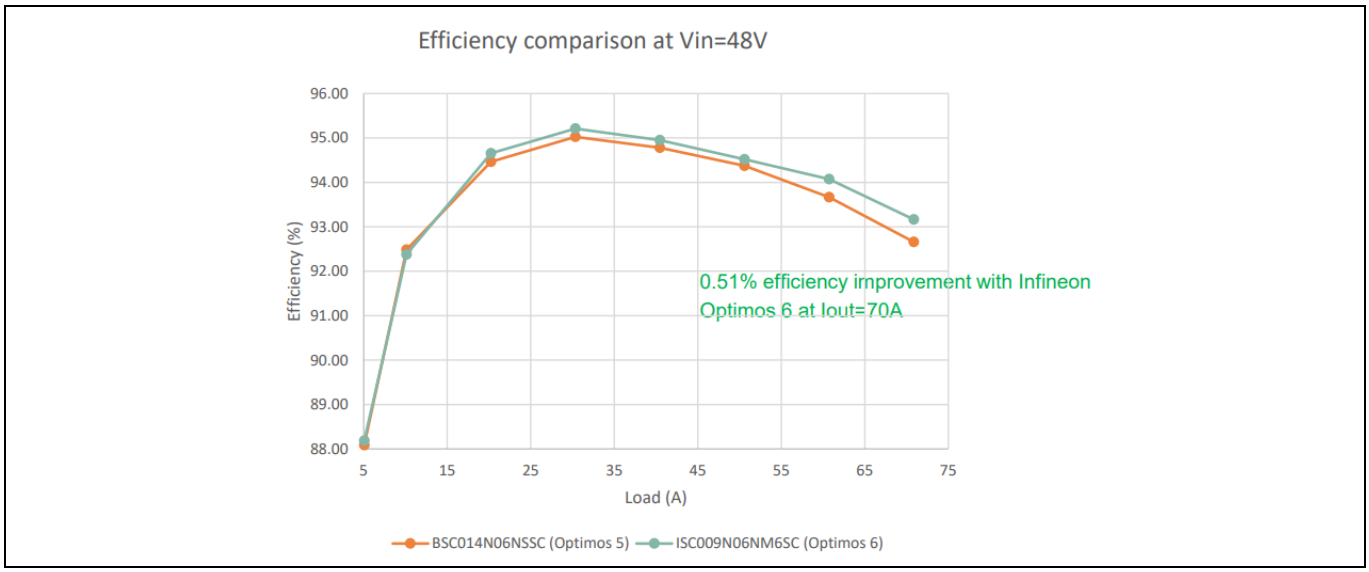
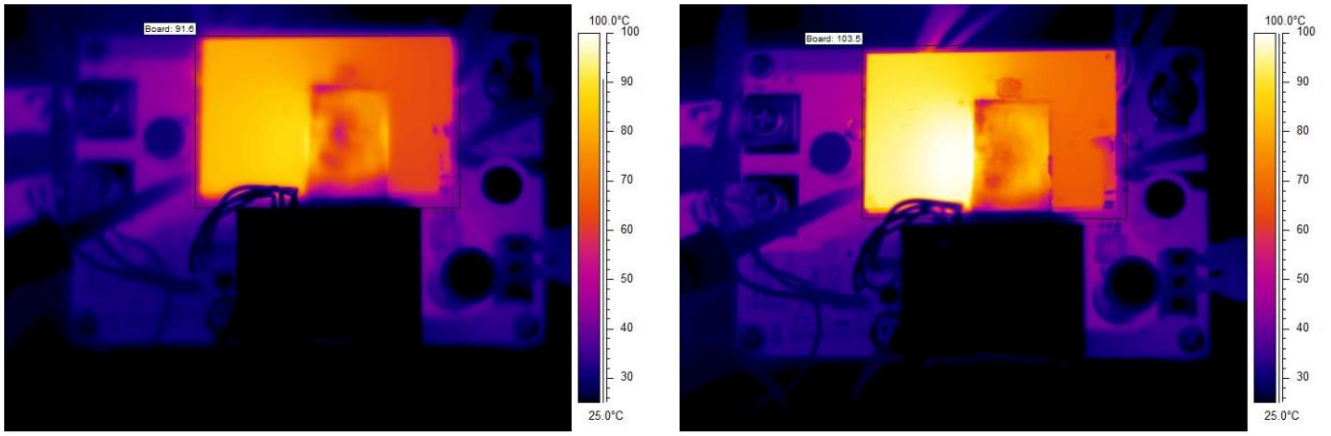


Figure 11 Efficiency comparison between OptiMOS™ 5 vs. OptiMOS™ 6 power MOSFETs

3.2.5 Thermal performance

At full-load condition, OptiMOS™ 6 power MOSFET 60 V shows 11.9°C cooler thermal performance at 840 W compared to OptiMOS™ 5 power MOSFET 60 V, which is shown in Figure 12.



OptiMOS™ 6 ISC009N06NM6SC
Board temperature: 91.6°C

OptiMOS™ 5 BSC014N06NSSC
Board temperature: 103.5°C

Figure 12 Thermal performance at 840 W comparison OptiMOS™ 5 vs. OptiMOS™ 6 power MOSFET

The efficiency plot Figure 11 shows a relevant improvement when comparing the Infineon OptiMOS™ 6 power MOSFET 60 V to the previous OptiMOS™ 5 power MOSFETs. The efficiency gain is quantified at approximately 0.5 percent.

The soft switched OptiMOS™ 6 power MOSFET shows 11.9°C cooler thermal performance at full-load condition compared to OptiMOS™ 5 power MOSFET.

Furthermore, the use of a snubber with the OptiMOS™ 6 power MOSFET also leads to an improvement in efficiency, while the waveforms demonstrate that a similar ringing behavior can be attained.

4 Summary

The soft switching OptiMOS™ 6 power MOSFET 60 V features a comprehensive portfolio with a wide range of $R_{DS(on)}$ values and different package options, SuperSO8 (PG-TSON-8, PG-WSON-8), 3.3 mm x 3.3 mm (PG-TTFN-9, PG-TSON-8, PG-WHTFN-9, and PG-WHSON-8) and PG-TSDSON-8 packages, allowing for flexible design and easy upgrade of existing designs with improved performance, increased efficiency, and reduced thermal management challenges.

Even for hard switching OptiMOS™ 6 power MOSFET 60 V applications, a benefit can be gained. An improvement in efficiency is observed, and with the use of an RC snubber to comply with the IPC-9592 standard, switching losses can be minimized.

The latest soft switching OptiMOS™ 6 power MOSFET 60 V technology enhances system performance, driving increased efficiency, and reliability.

5 Related resources

- OptiMOS™ 6 power MOSFET webpage
- MOSFET forum from developer community
- EE times RC Snubber Calculation

Abbreviations

Abbreviation	Expanded form
BMS	battery management system
BOM	bill of materials
FB	full bridge
FOM	figure of merit
SMPS	switch-mode power supply
ZSC	zero-voltage switching switched-capacitor
ZVS	zero-voltage switching

Revision history

Document revision	Date	Description of changes
V 1.0	2026-01-15	Initial release

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