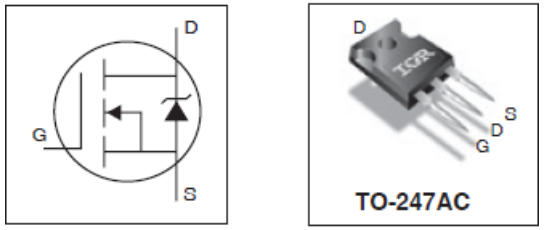
1. IRFP4227PBF

Key Parameters		
V_{DS} max	200	V
$V_{DS\ (Avalanche)}$ typ.	240	V
$R_{DS(ON)}$ typ. @ 10V	21	mΩ
I_{RP} max @ T_C= 100°C	130	A
T_J max	175	°C



TO-247AC

G	D	S
Gate	Drain	Source

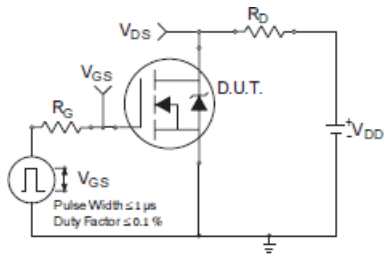


Fig 22a. Switching Time Test Circuit

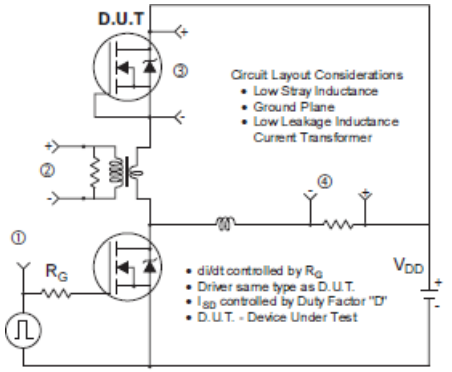


Fig 18. Diode Reverse Recovery Test Cir

	Parameter	Min.	Typ.	Max.	Units	Conditions
$t_{d(on)}$	Turn-On Delay Time	—	33	—	ns	V_{DD} = 100V, V_{GS} = 10V ③
t_r	Rise Time	—	20	—		I_D = 46A
$t_{d(off)}$	Turn-Off Delay Time	—	21	—		R_G = 2.5Ω
t_f	Fall Time	—	31	—		See Fig. 22
t_{rr}	Reverse Recovery Time	—	100	150	ns	T_J = 25°C, I_F = 46A, V_{DD} = 50V
Q_{rr}	Reverse Recovery Charge	—	430	640	nC	di/dt = 100A/µs ③

1A

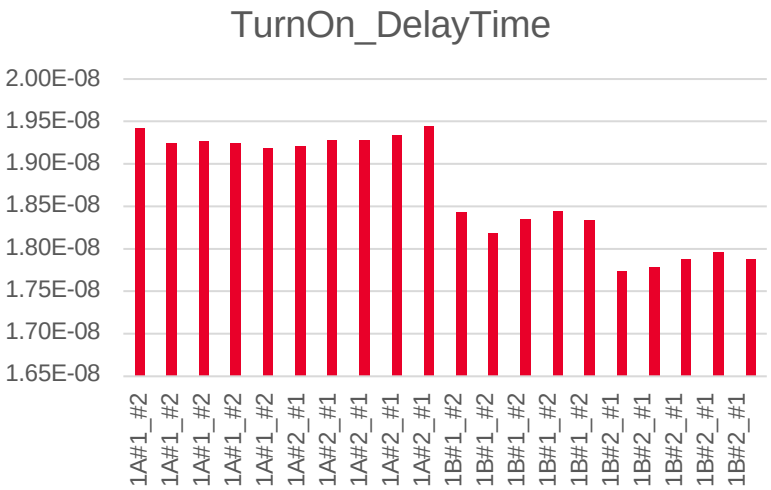
1B

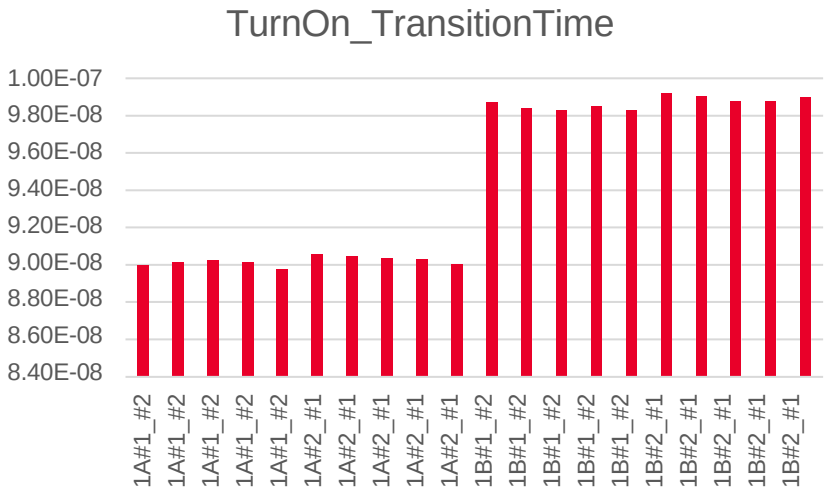
1A, 1B (IRFP4227PBF) Standard

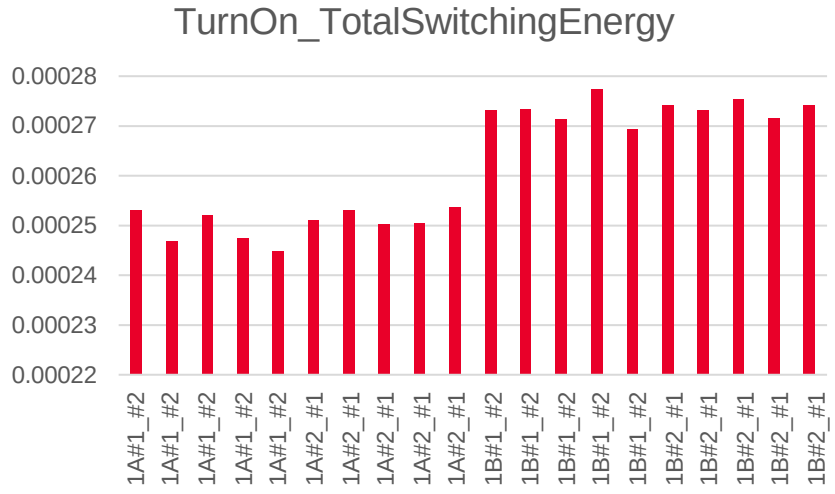
Vds=100V, Ids=46A, RgL=2.5ohm, RgH=0ohm, Vgs=0 to 10V, IntLv 10%-90%

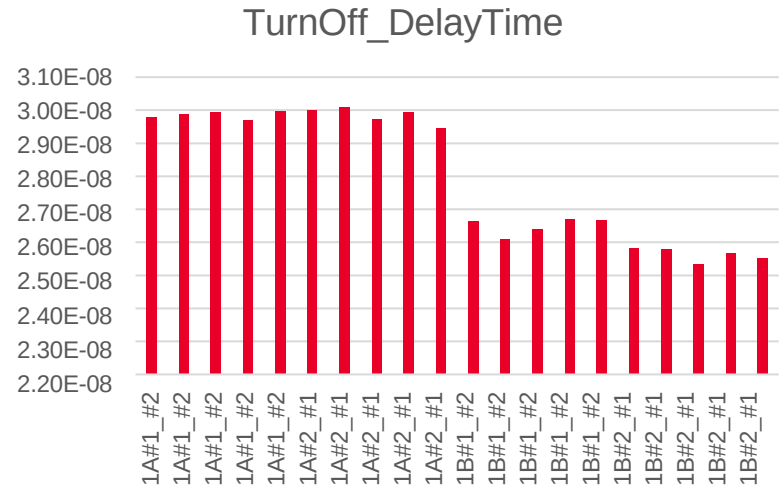
- 1A#1_#2: Low=#1, High=#2
- 1A#2_#1: Low=#2, High=#1
- 1B#1_#2: Low=#1, High=#2
- 1B#2_#1: Low=#2, High=#1

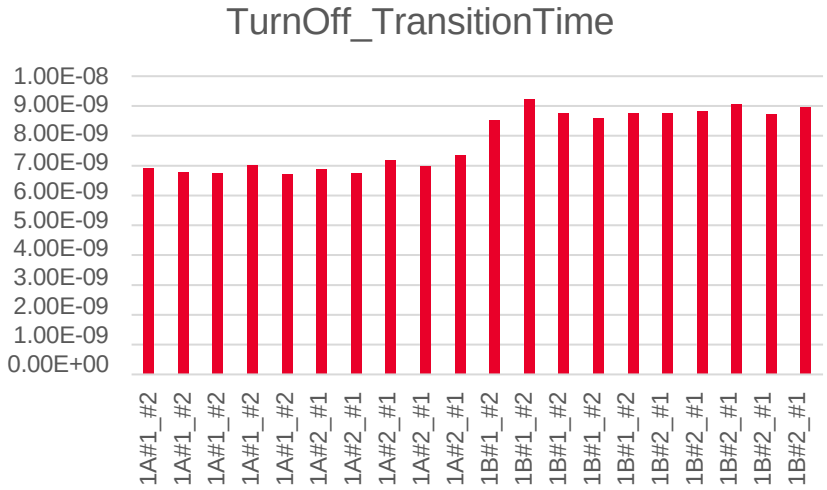
※各組合せ5回測定

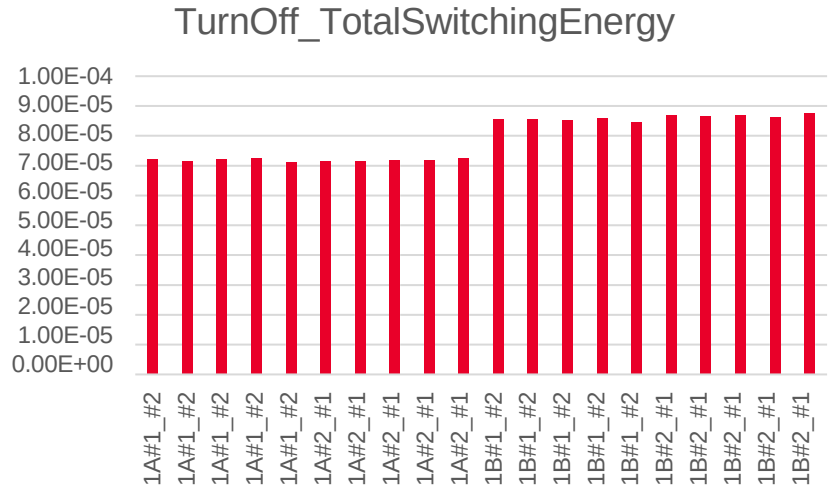












1A, 1B (IRFP4227PBF) Standard

Vds=100V, Ids=46A, RgL=2.5ohm, RgH=0ohm, Vgs=0 to 10V, IntLv 10%-90%

- Ch2,3,4 = 1A#1_#2, Ids, Vgs, Vds
- Ch5,6,7 = 1B#1_#2, Ids, Vgs, Vds

Turn OFF

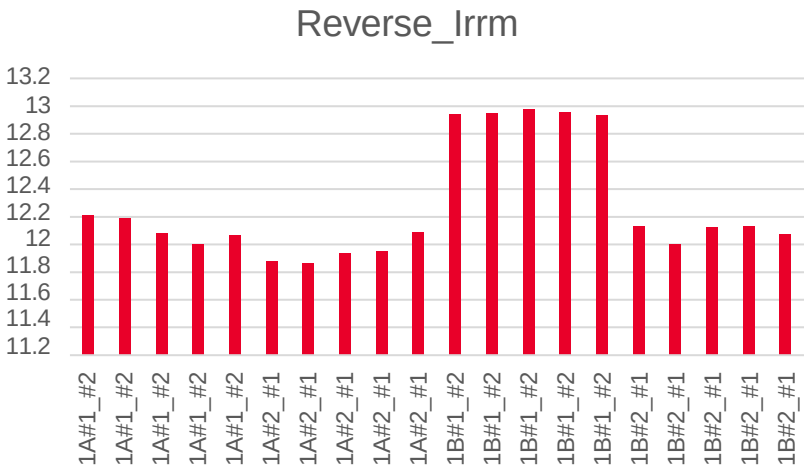
Turn ON

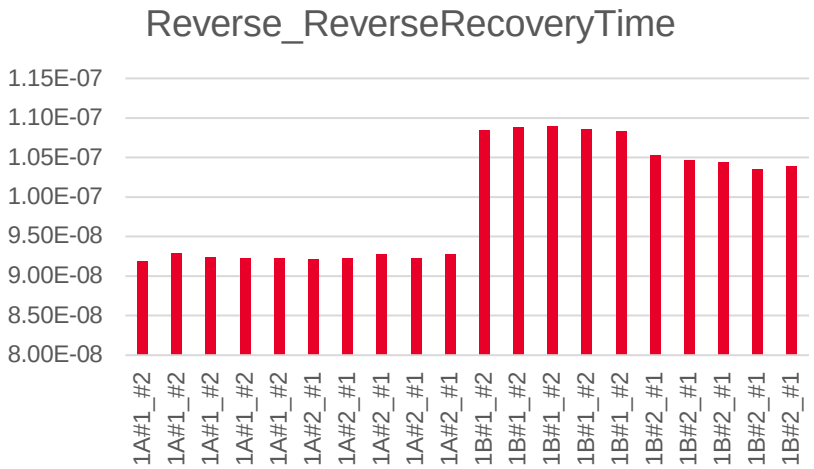
1A, 1B (IRFP4227PBF) Reverse Recovery

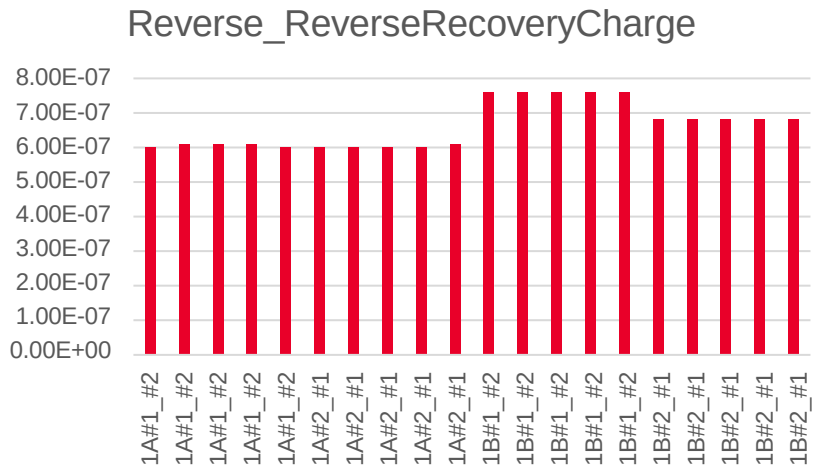
Vds=50V, Ids=46A, RgL=0ohm, RgH=400ohm, Vgs=0 to 13V

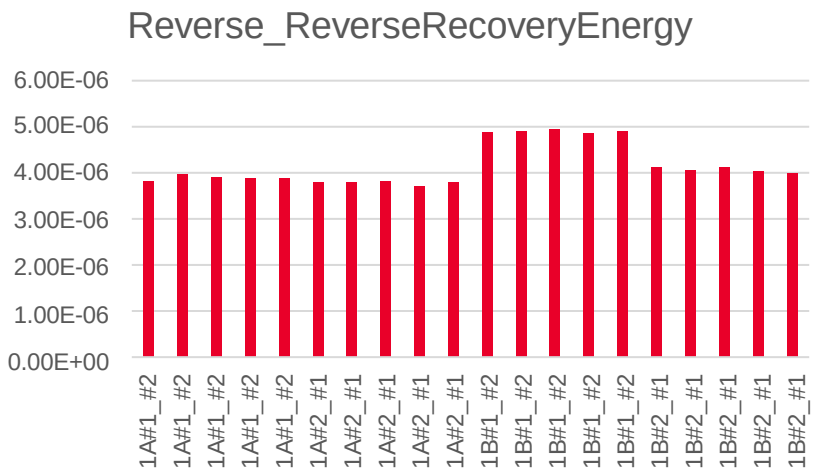
- 1A#1_#2: Low=#1, High=#2
- 1A#2_#1: Low=#2, High=#1
- 1B#1_#2: Low=#1, High=#2
- 1B#2_#1: Low=#2, High=#1

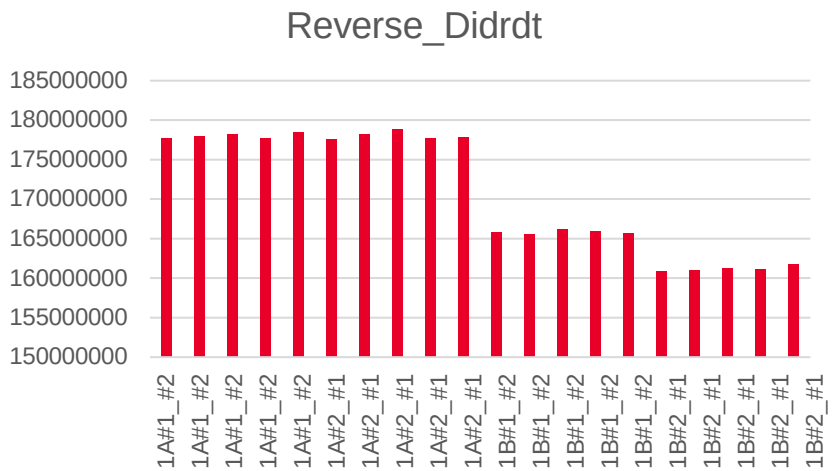
※各組合せ5回測定











1A, 1B (IRFP4227PBF) Reverse Recovery

Vds=50V, Ids=46A, RgL=0ohm, RgH=400ohm, Vgs=0 to 13V

- Ch2,4 = 1A#1_#2, Ids, Vds
- Ch5,7 = 1B#1_#2, Ids, Vds

2. STW77N65M5

Features

Order code	V_{DSS} @$T_{jmax.}$	$R_{DS(on)}$ max.	I_D
STW77N65M5	710 V	< 0.038 Ω	69 A

- Higher V_{DSS} rating
- Higher dv/dt capability
- Excellent switching performance
- Easy to drive
- 100% avalanche tested

Application

Switching applications

Description

This device is a N-channel MDmesh™ V Power MOSFET based on an innovative proprietary vertical process technology, which is combined with STMicroelectronics' well-known PowerMESH™ horizontal layout structure. The resulting product has extremely low on-resistance, which is unmatched among silicon-based Power MOSFETs, making it especially suitable for applications which require superior power density and outstanding efficiency.

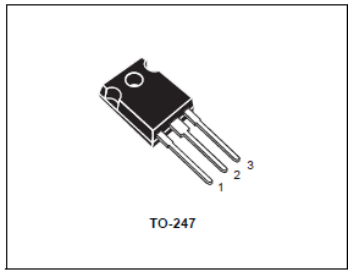


Figure 1. Internal schematic diagram

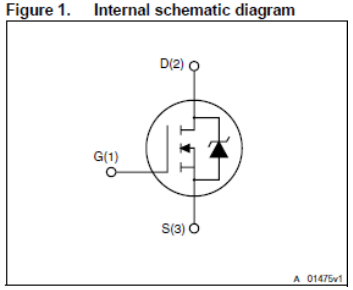


Figure 17. Test circuit for inductive load switching and diode recovery times

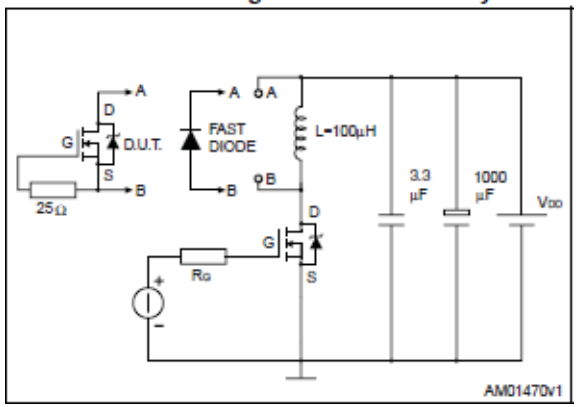


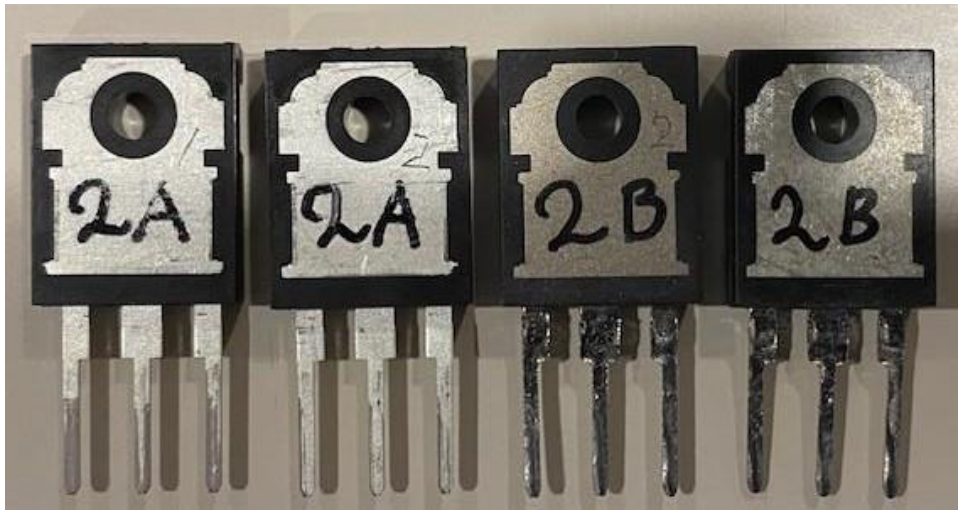
Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(V)}$	Voltage delay time	V_{DD} = 400 V, I_D = 40 A,		160		ns
$t_{r(V)}$	Voltage rise time	R_G = 4.7 Ω V_{GS} = 10 V	-	22	-	ns
$t_{f(i)}$	Current fall time	(see *Figure 17*)		20		ns
$t_{c(off)}$	Crossing time	(see *Figure 20*)		40		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		69	A
I_{SDM} (1)	Source-drain current (pulsed)				276	A
V_{SD} (2)	Forward on voltage	I_{SD} = 69 A, V_{GS} = 0	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 69 A,		570		ns
Q_{rr}	Reverse recovery charge	di/dt = 100 A/µs	-	14		µC
I_{RRM}	Reverse recovery current	V_{DD} = 100 V (see *Figure 17*)		48		A
t_{rr}	Reverse recovery time	I_{SD} = 69 A,		700		ns
Q_{rr}	Reverse recovery charge	di/dt = 100 A/µs	-	20		µC
I_{RRM}	Reverse recovery current	V_{DD} = 100 V, T_j = 150 °C (see *Figure 17*)		58		A

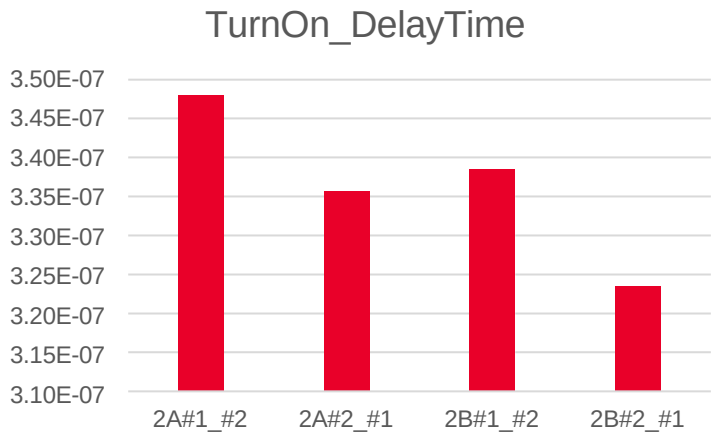
2A 2B

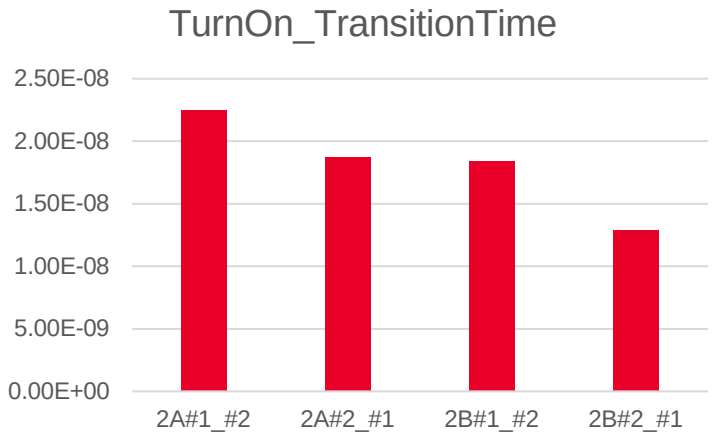


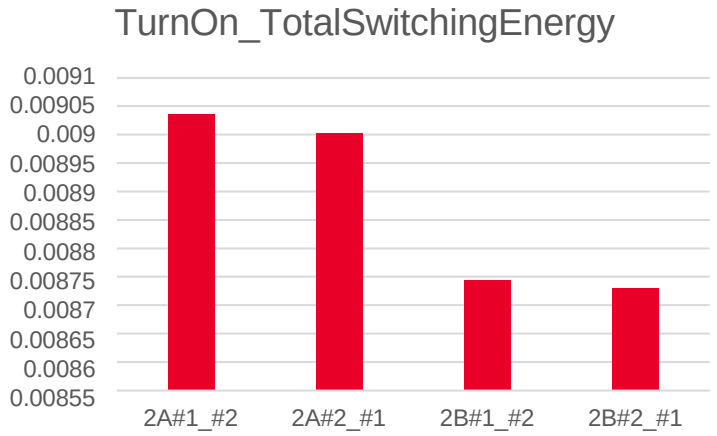
KEYSIGHT

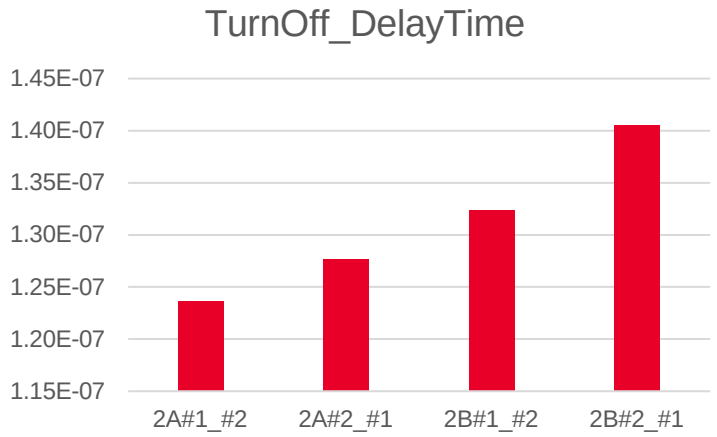
2A, 2B (STW77N65M5) Standard

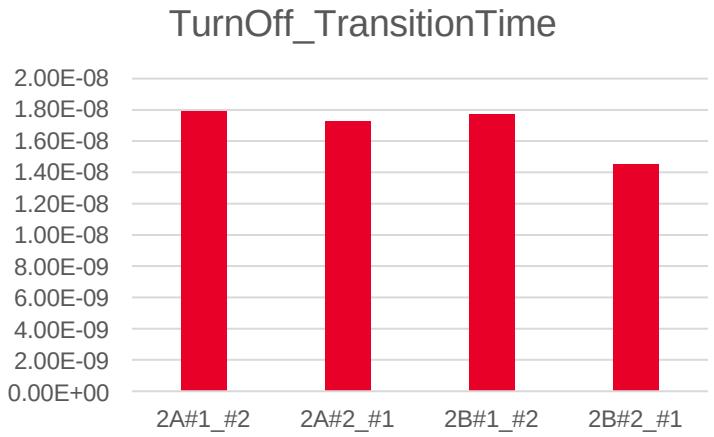
Vds=400V, Ids=40A, RgL=4.9ohm, RgH=0ohm, Vgs=0 to 10V

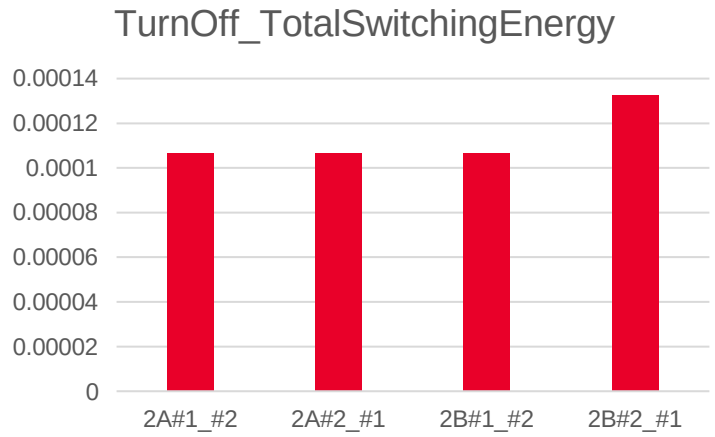








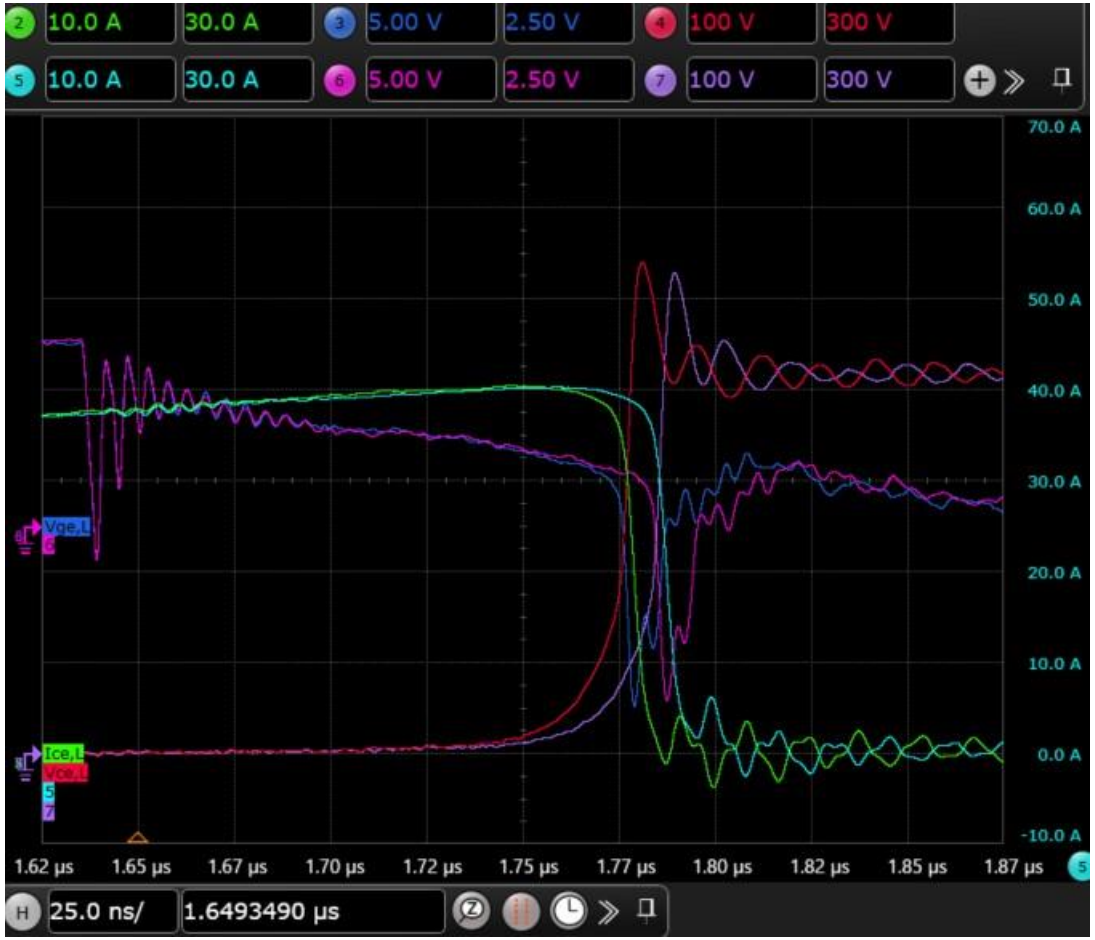




2A, 2B (STW77N65M5) Standard

Vds=400V, Ids=40A, RgL=4.9ohm, RgH=0ohm, Vgs=0 to 10V

- Ch2,3,4 = 2A#1_#2, Ids, Vgs, Vds
- Ch5,6,7 = 2B#1_#2, Ids, Vgs, Vds

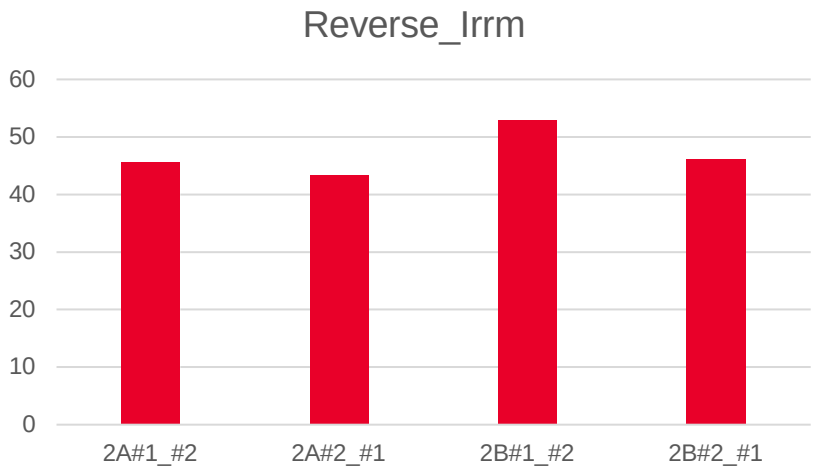


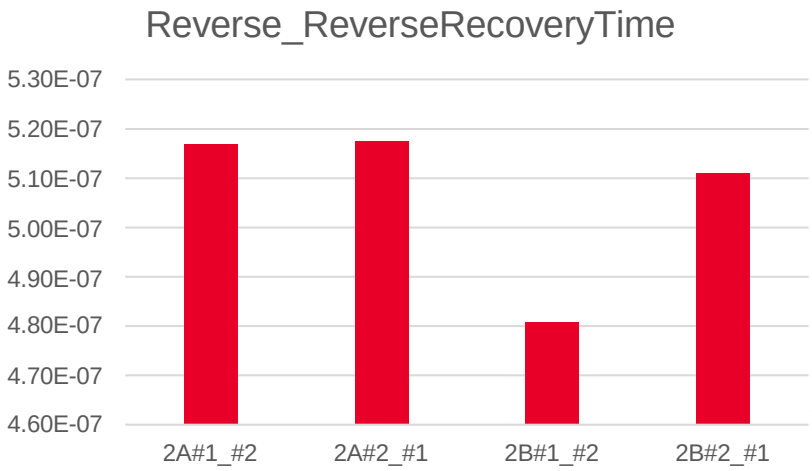
Turn OFF

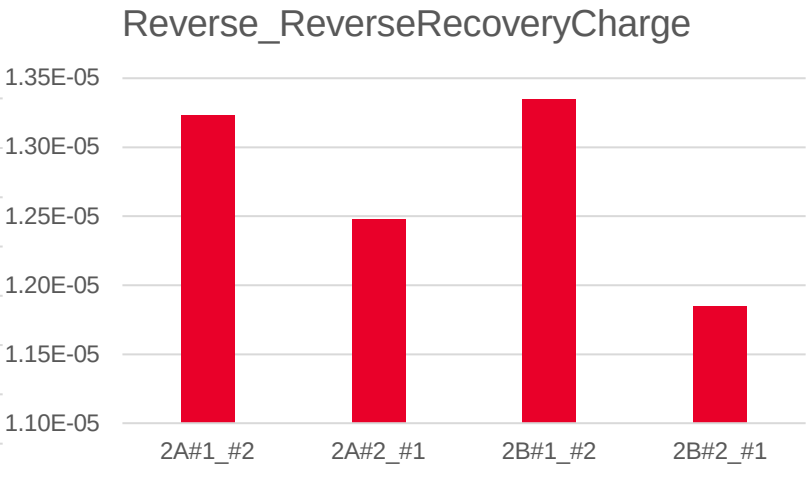
Turn ON

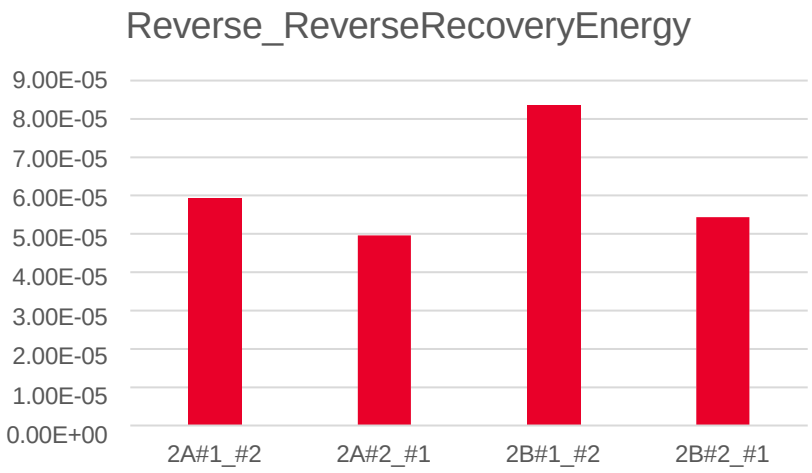
2A, 2B (STW77N65M5) Reverse Recovery

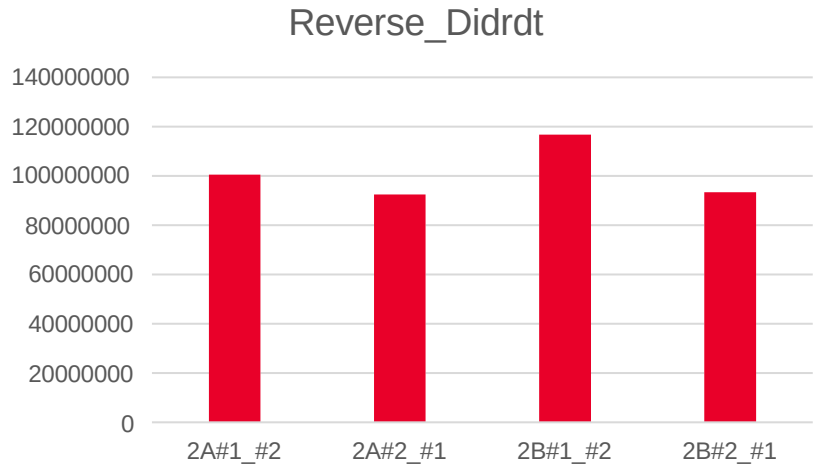
Vds=100V, Ids=69A, RgL=20ohm, RgH=400ohm, Vgs=0 to 13.5V







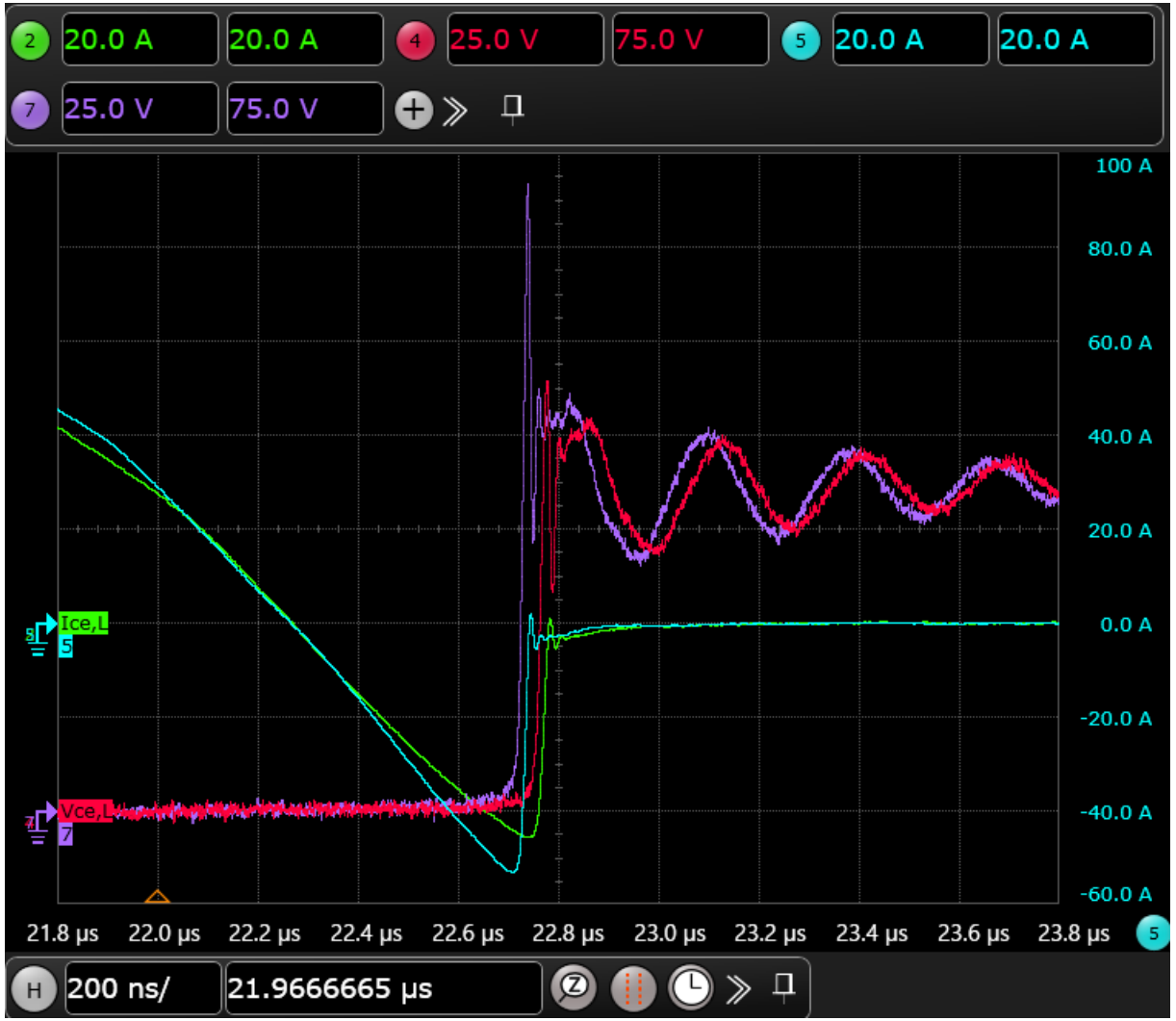




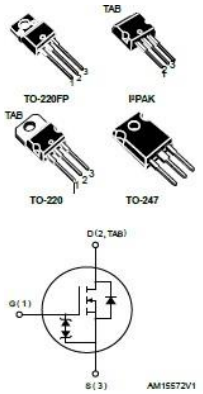
2A, 2B (STW77N65M5) Reverse Recovery

Vds=100V, Ids=69A, RgL=20ohm, RgH=400ohm, Vgs=0 to 13.5V

- Ch2,4 = 2A#1_#2, Ids, Vds
- Ch5,7 = 2B#1_#2, Ids, Vds



3. STW33N60M2



Features

Order codes	V_{DS} @ T_{Jmax}	$R_{DS(on)}$ max.	I_D	Package
STF33N60M2	650 V	0.125 Ω	26 A	TO-220FP
STI33N60M2				I²PAK
STP33N60M2				TO-220
STW33N60M2				TO-247

- Extremely low gate charge
- Excellent output capacitance (C_{OSS}) profile
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications
- LLC converters, resonant converters

Description

Figure 20. **Test circuit for inductive load switching and diode recovery times**

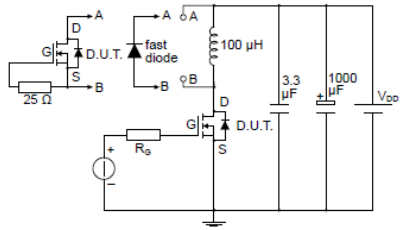


Table 6. **Switching times**

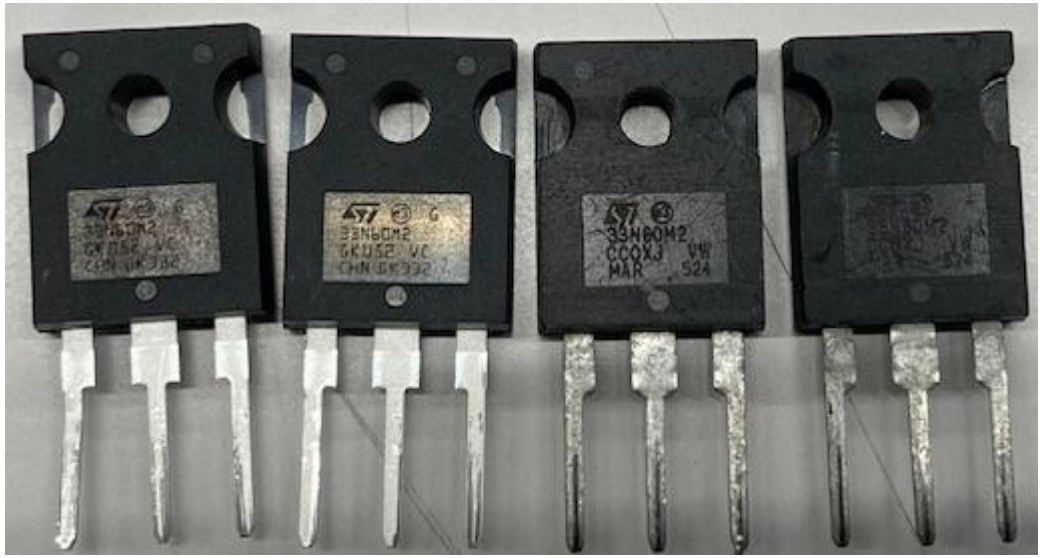
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 13 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 18. Test circuit for resistive load switching times and Figure 23. Switching time waveform)	-	16	-	ns
t_r	Rise time		-	9.6	-	ns
$t_{d(off)}$	Turn-off delay time		-	109	-	ns
t_f	Fall time		-	9	-	ns

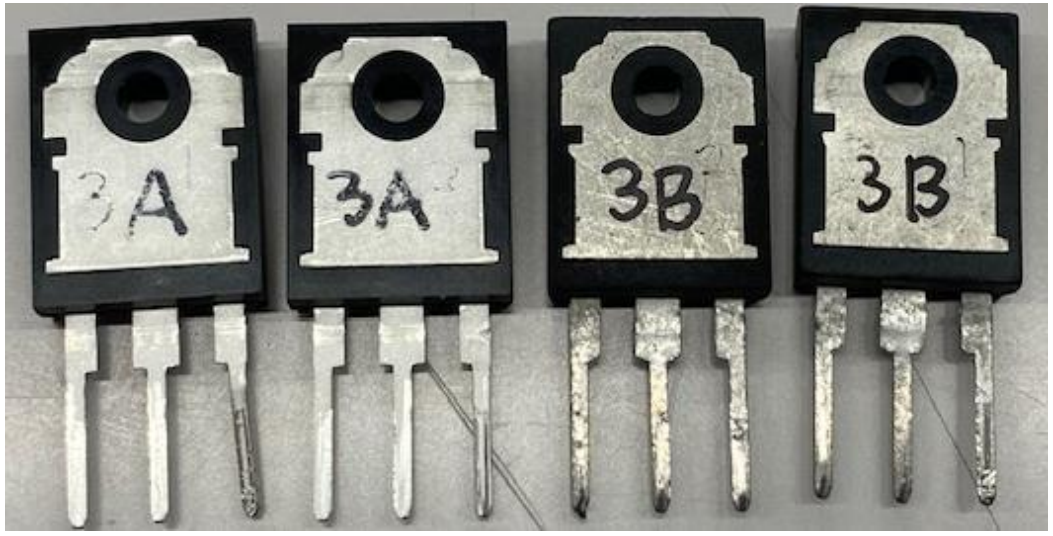
Table 7. **Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		26	A
I_{SDM}(1)	Source-drain current (pulsed)		-		104	A
V_{SD}(2)	Forward on voltage	I_{SD} = 26 A, V_{GS} = 0 V	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 26 A, di/dt = 100 A/µs, V_{DD} = 60 V (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	375		ns
Q_{rr}	Reverse recovery charge		-	5.6		µC
I_{RRM}	Reverse recovery current		-	30		A
t_{rr}	Reverse recovery time	I_{SD} = 26 A, di/dt = 100 A/µs, V_{DD} = 60 V, T_j = 150 °C (see Figure 20. Test circuit for inductive load switching and diode recovery times)	-	478		ns
Q_{rr}	Reverse recovery charge		-	7.7		µC
I_{RRM}	Reverse recovery current		-	35.5		A

3A

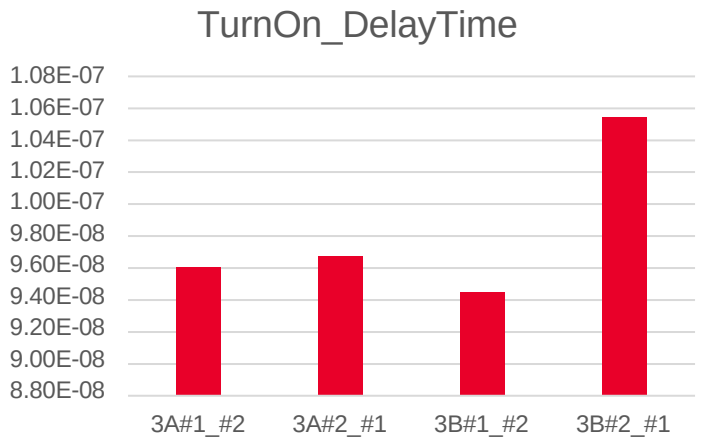
3B

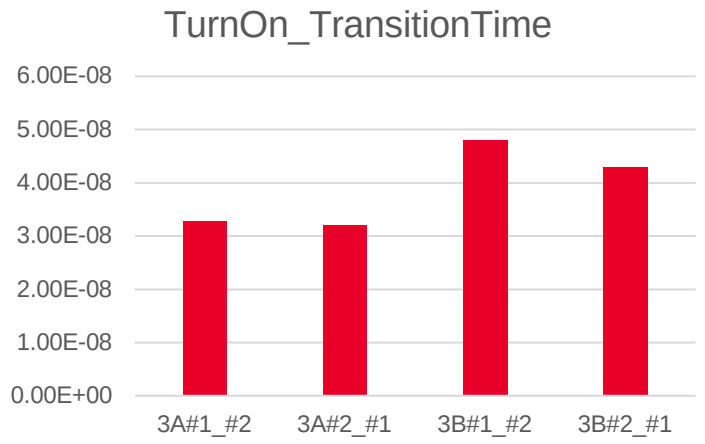


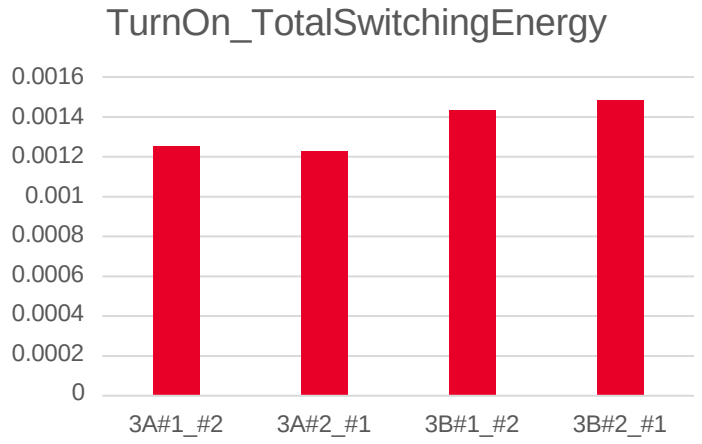


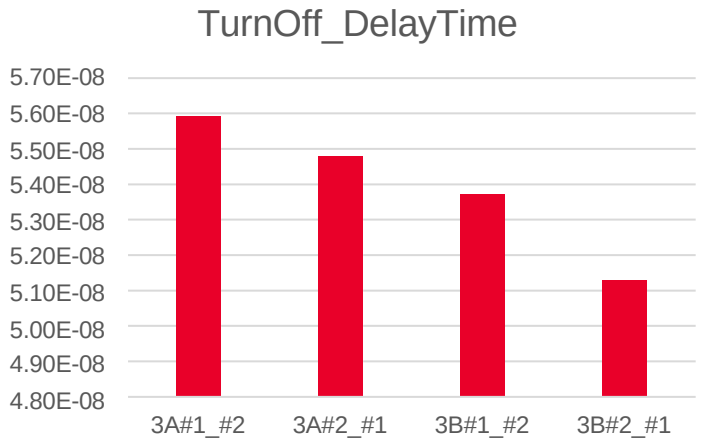
3A, 3B (STW33N60M2) Standard

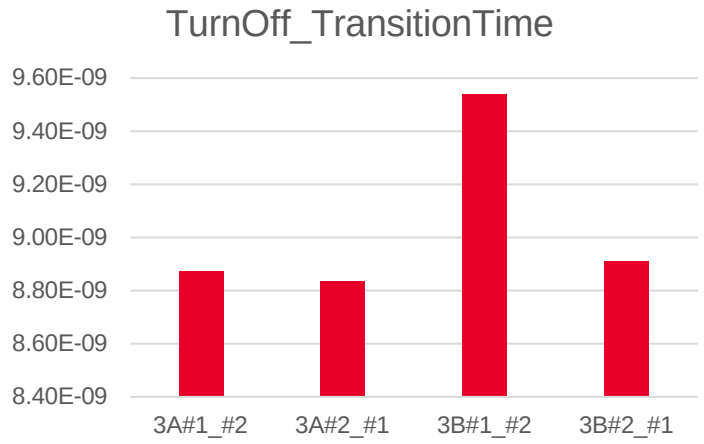
Vds=300V, Ids=13A, RgL=4.9ohm, RgH=0ohm, Vgs=0 to 10V

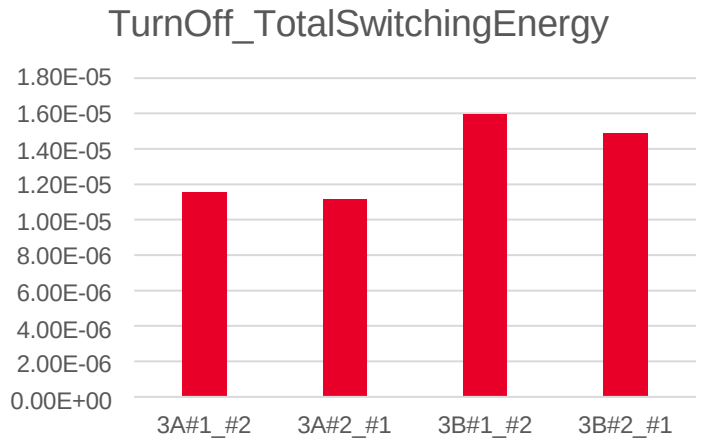








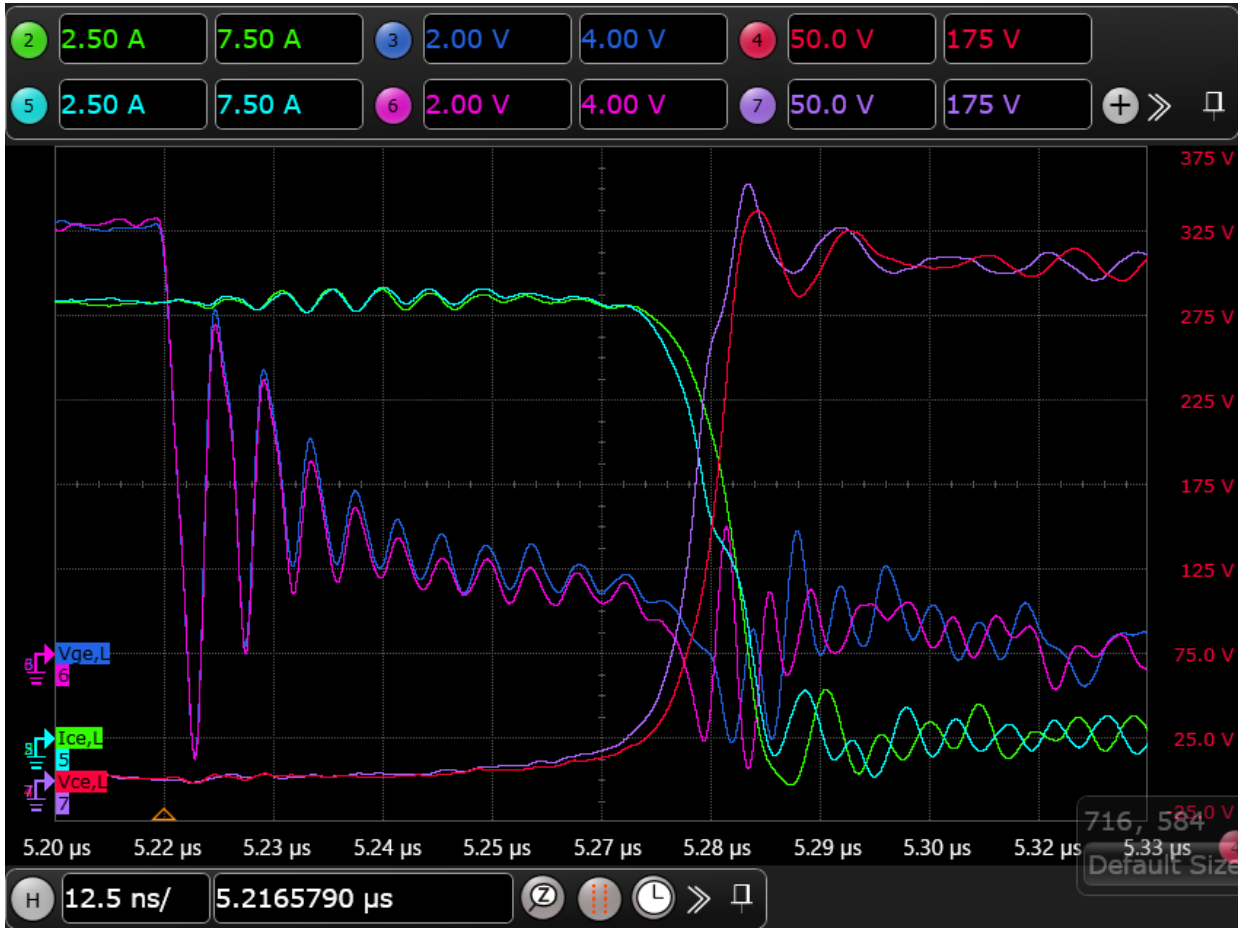




3A, 3B (STW33N60M2) Standard

Vds=300V, Ids=13A, RgL=4.9ohm, RgH=0ohm, Vgs=0 to 10V

- Ch2,3,4 = 3A#1_#2, Ids, Vgs, Vds
- Ch5,6,7 = 3B#1_#2, Ids, Vgs, Vds

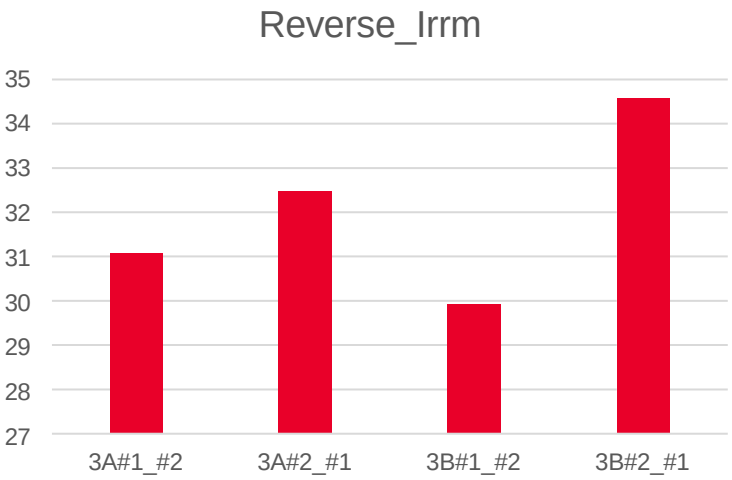


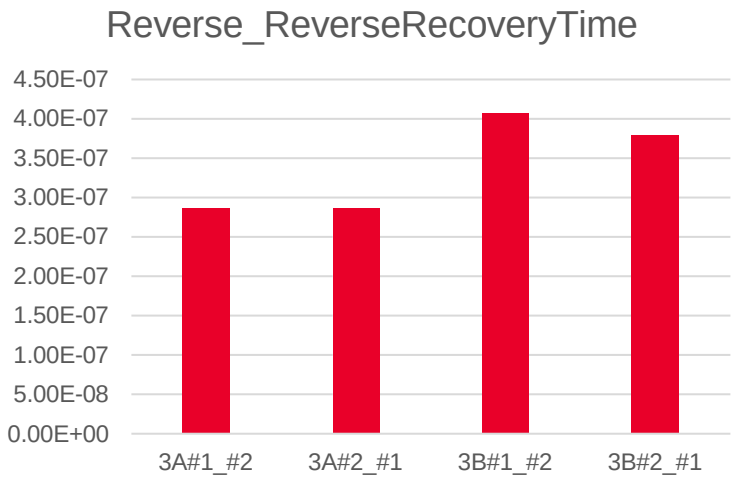
Turn OFF

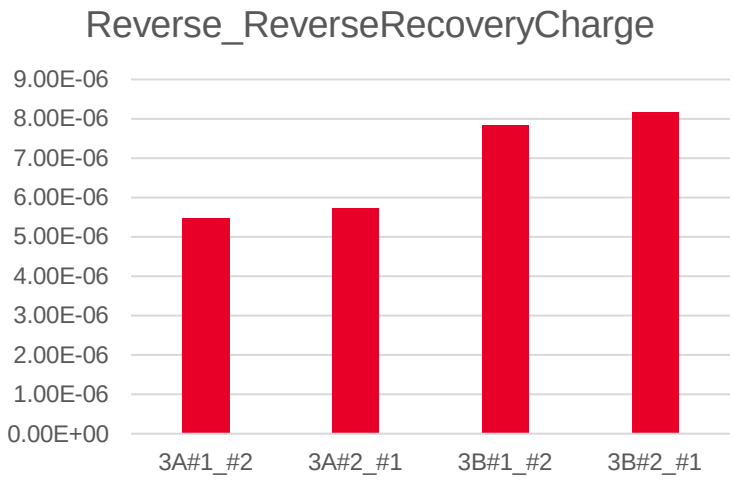
Turn ON

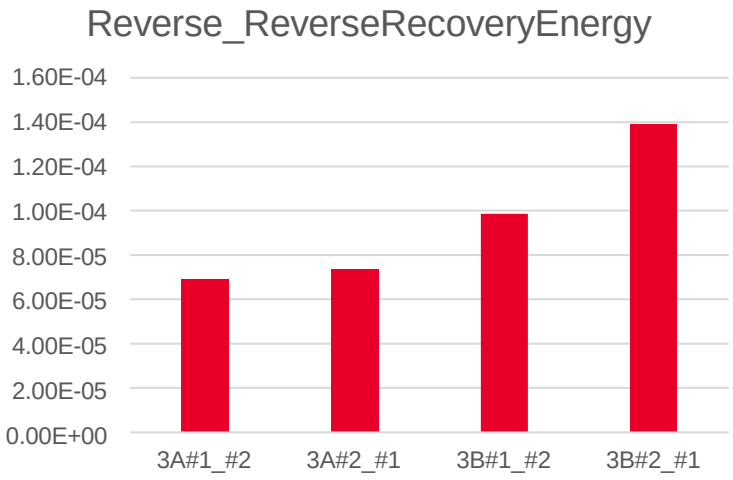
3A, 3B (STW33N60M2) RR

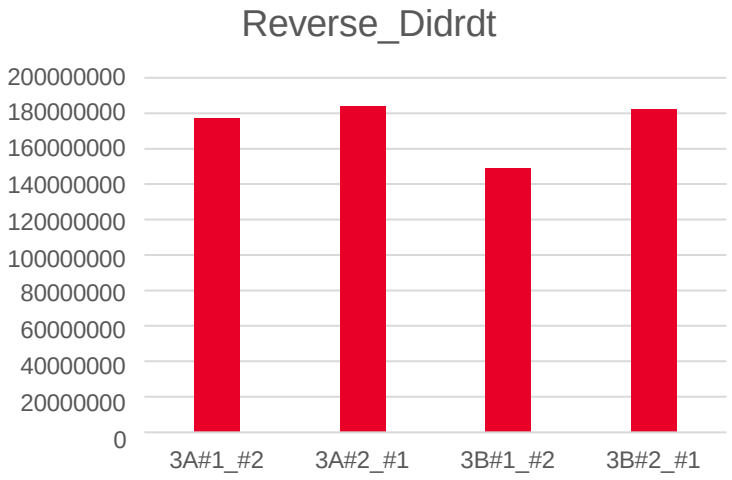
Vds=60V, Ids=26A, RgL=20ohm, RgH=400ohm, Vgs=0 to 13V







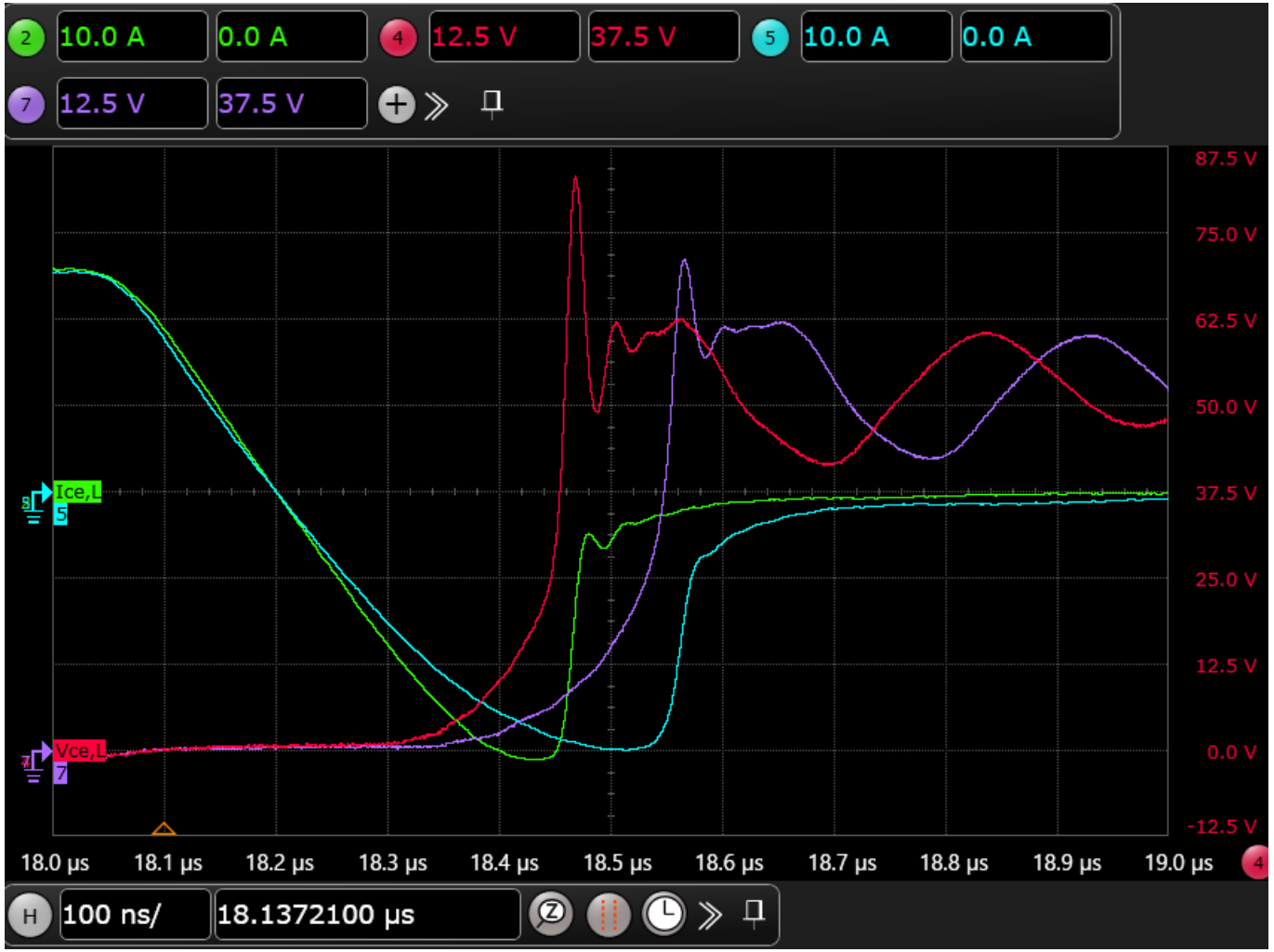




3A, 3B (STW33N60M2) RR

Vds=60V, Ids=26A, RgL=20ohm, RgH=400ohm, Vgs=0 to 13V

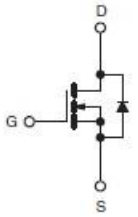
- Ch2,4 = 3A#1_#2, Ids, Vds
- Ch5,7 = 3B#1_#2, Ids, Vds



4. SIHG73N60E

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ max. at 25 °C (Ω)	V_{GS} = 10 V	0.039
Q_g max. (nC)	362	
Q_{gs} (nC)	48	
Q_{gd} (nC)	98	
Configuration	Single	

TO-247AC



N-Channel MOSFET

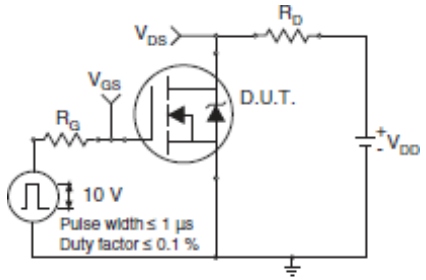
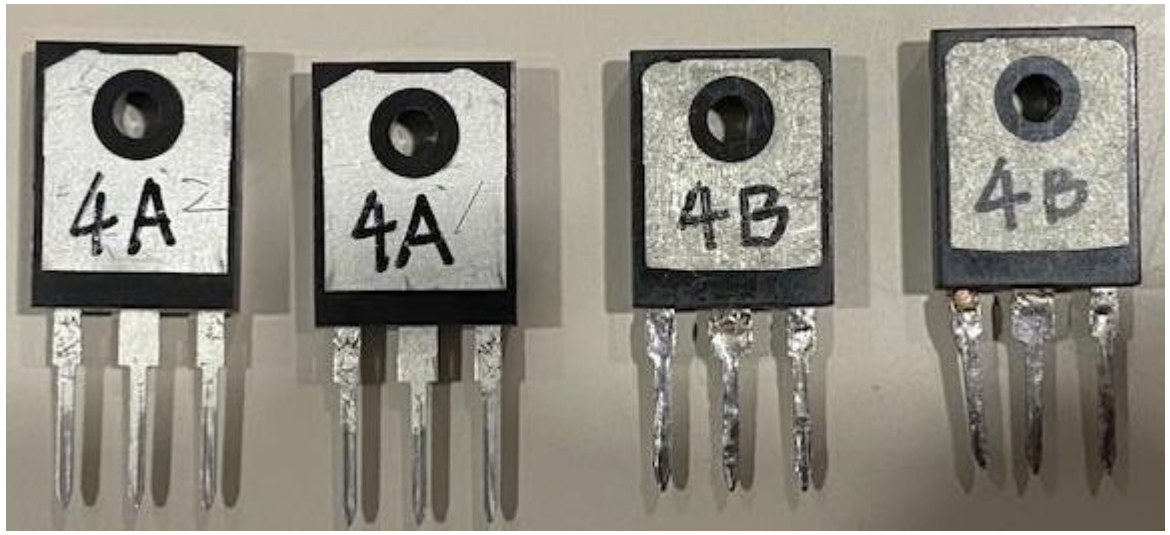


Fig. 13 - Switching Time Test Circuit

Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 480 V, I_D = 24 A, V_{GS} = 10 V, R_g = 10 Ω	-	63	95	ns
Rise Time	t_r		-	105	158	
Turn-Off Delay Time	$t_{d(off)}$		-	290	435	
Fall Time	t_f		-	120	180	

Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = I_S = 24 A, dI/dt = 100 A/µs, V_R = 25 V	-	657	1314	ns
Reverse Recovery Charge	Q_{rr}		-	14.6	29.2	µC
Reverse Recovery Current	I_{RRM}		-	34.7	-	A

4A 4B

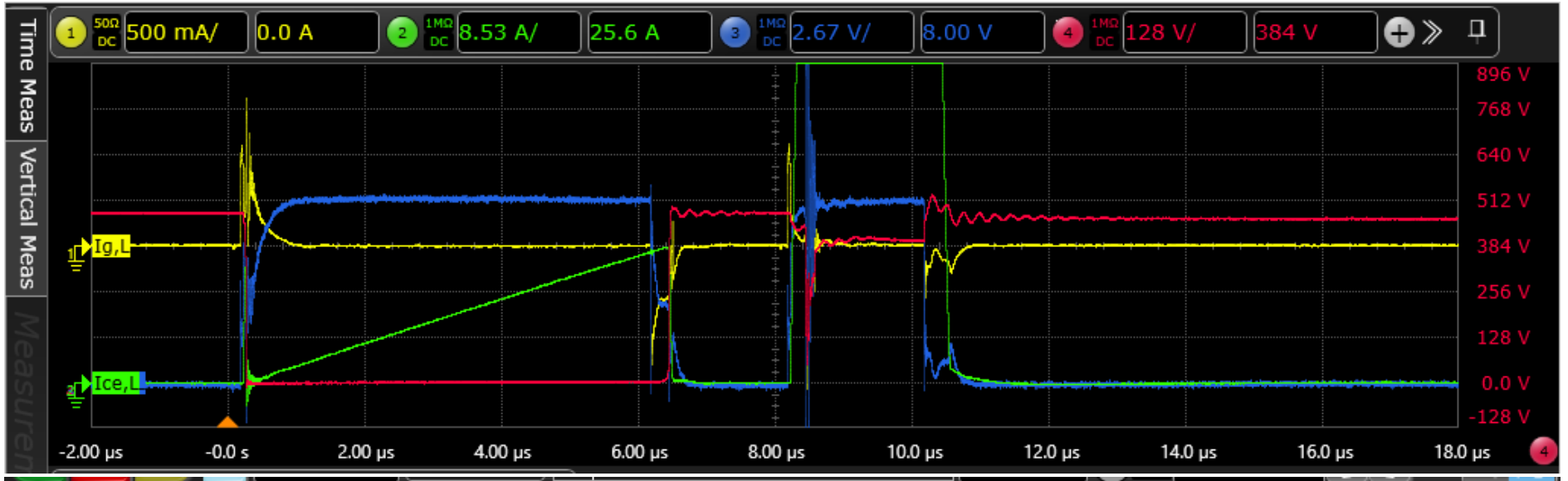


4A, 4B (SIHG73N60E) Standard

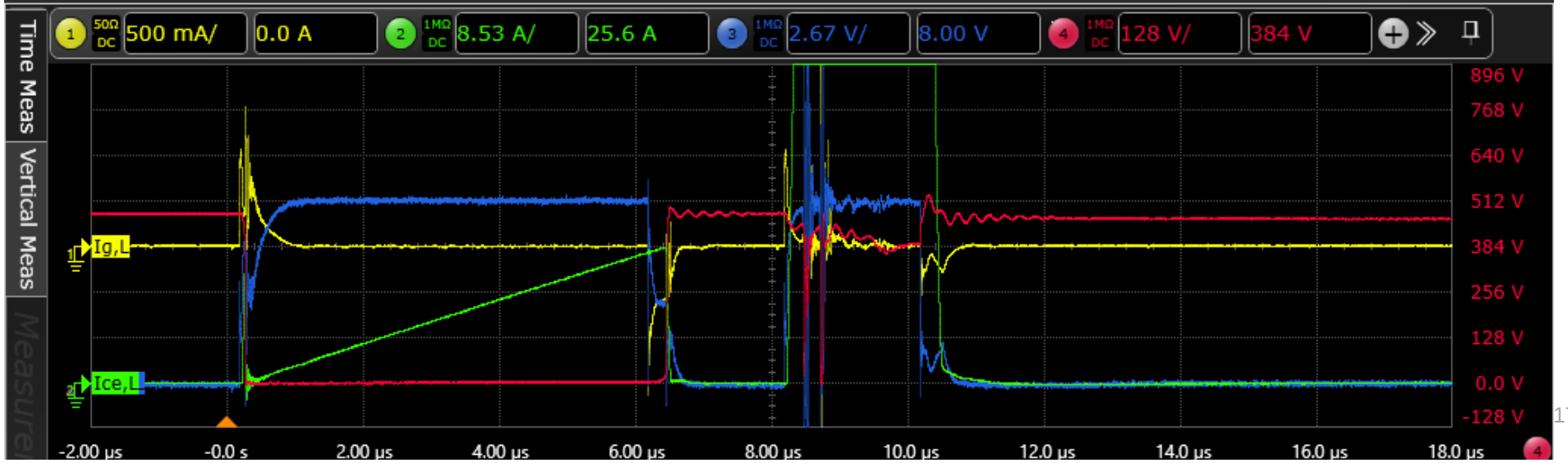
※Turn-Off 中にHigh-side DUT破壊

Vds=480V, Ids=24A, RgL=8ohm, RgH=0ohm, Vgs=0 to 10V

4A
#1 Low
#2 High

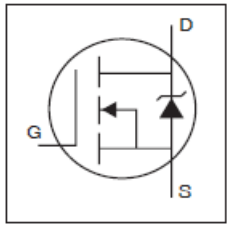


4B
#1 Low
#2 High



5. IRFP260NPBF

- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Ease of Paralleling
- Simple Drive Requirements
- Lead-Free



V_{DSS} = 200V

$R_{DS(on)}$ = 0.04Ω

I_D = 50A

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.

TO-247AC

$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	V_{DD} = 100V
t_r	Rise Time	—	60	—		I_D = 28A
$t_{d(off)}$	Turn-Off Delay Time	—	55	—		R_G = 1.8Ω
t_f	Fall Time	—	48	—		V_{GS} = 10V ④
t_{rr}	Reverse Recovery Time	—	268	402	ns	T_J = 25°C, I_F = 28A
Q_{rr}	Reverse Recovery Charge	—	1.9	2.8	µC	di/dt = 100A/µs ④

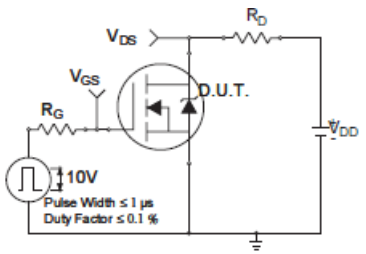
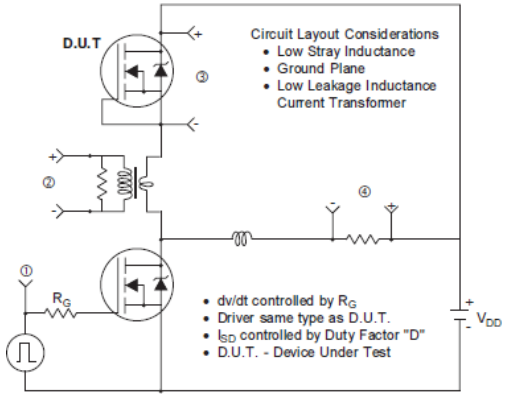


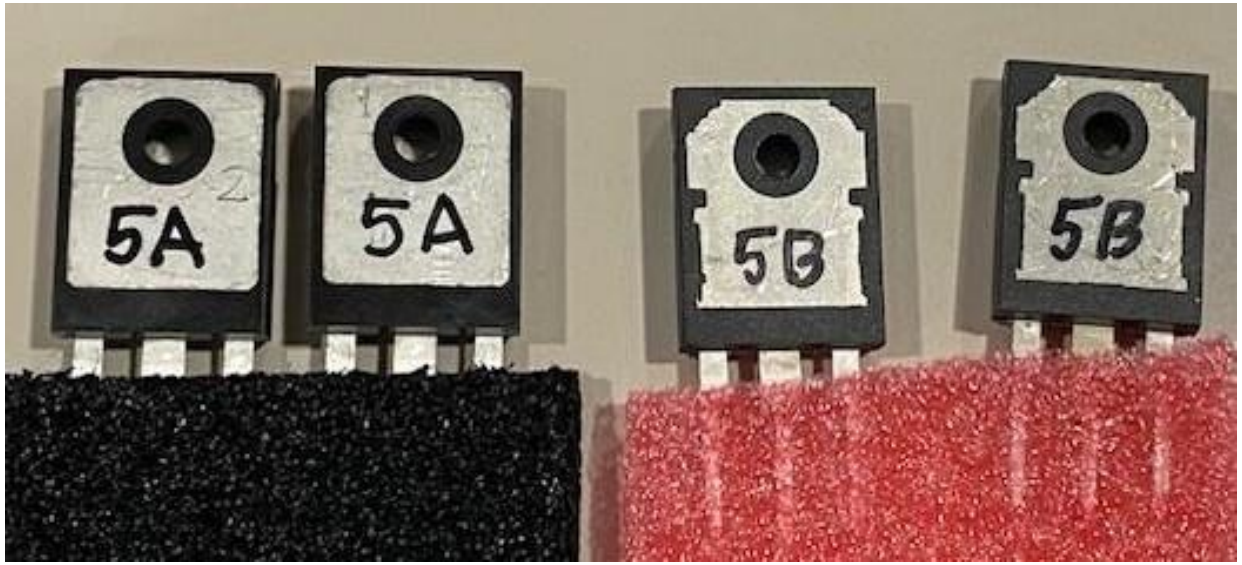
Fig 10a. Switching Time Test Circuit

Peak Diode Recovery dv/dt Test Circuit



5A

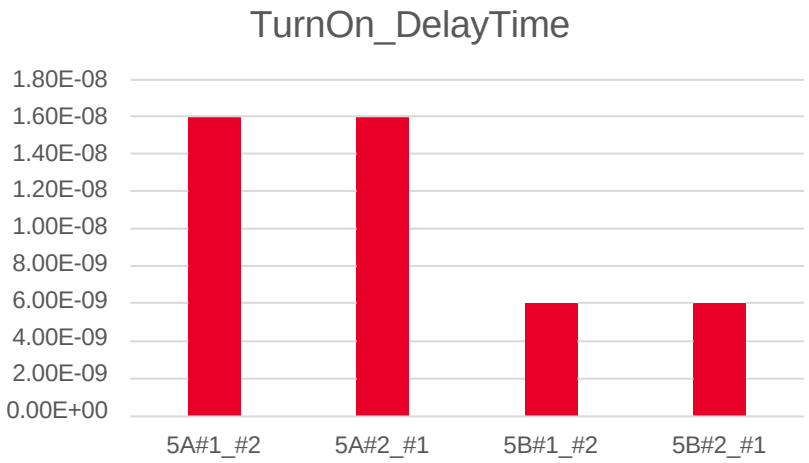
5B

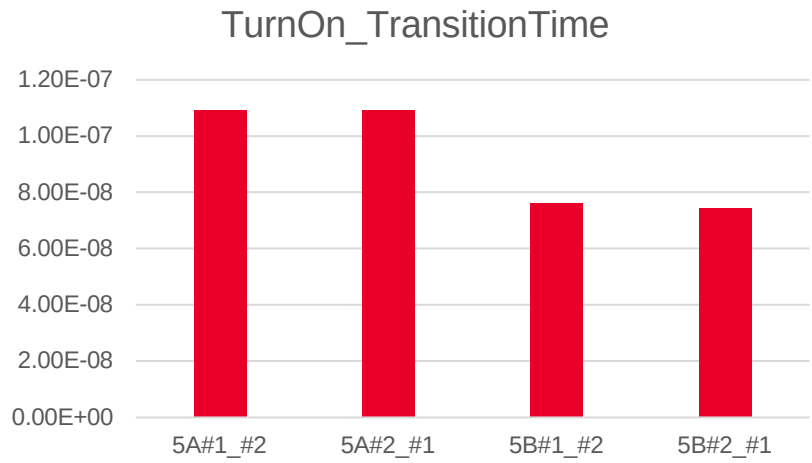


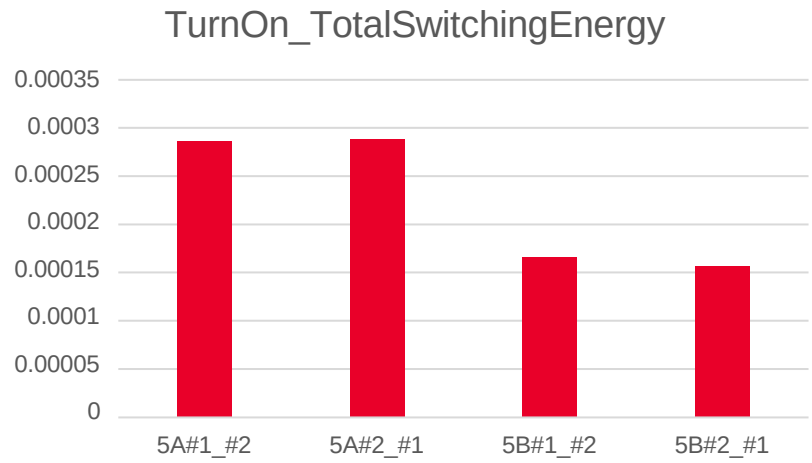
KEYSIGHT

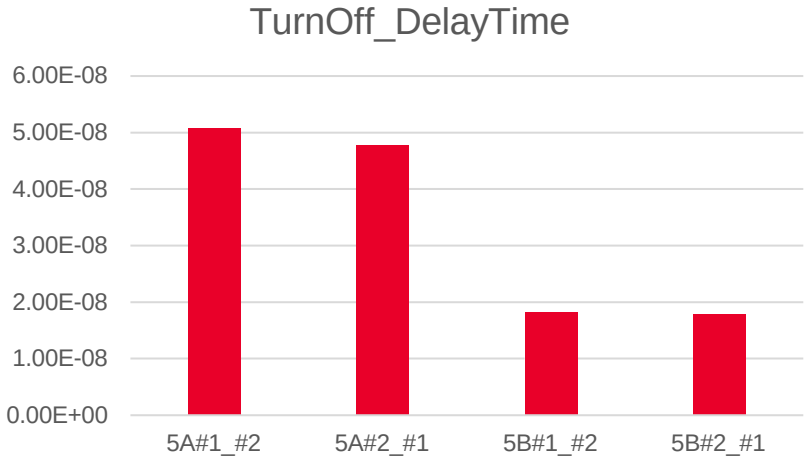
5A, 5B (IRFP260NPBF) Standard

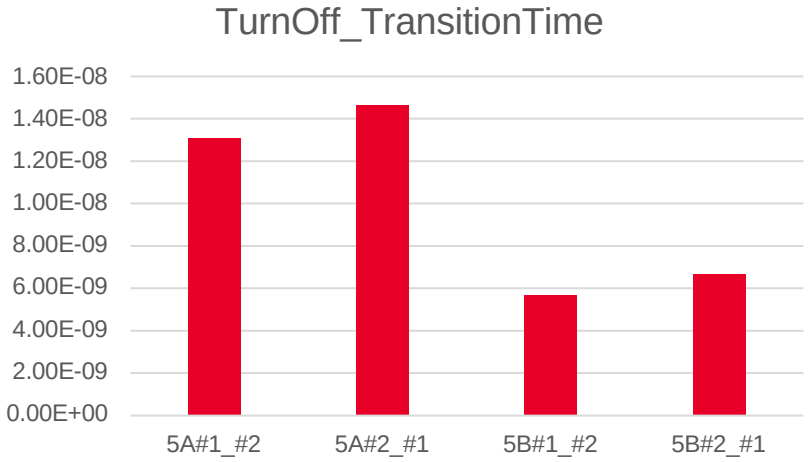
Vds=100V, Ids=28A, RgL=2.5ohm, RgH=0ohm, Vgs=0 to 10V, IntLv 90-10%,

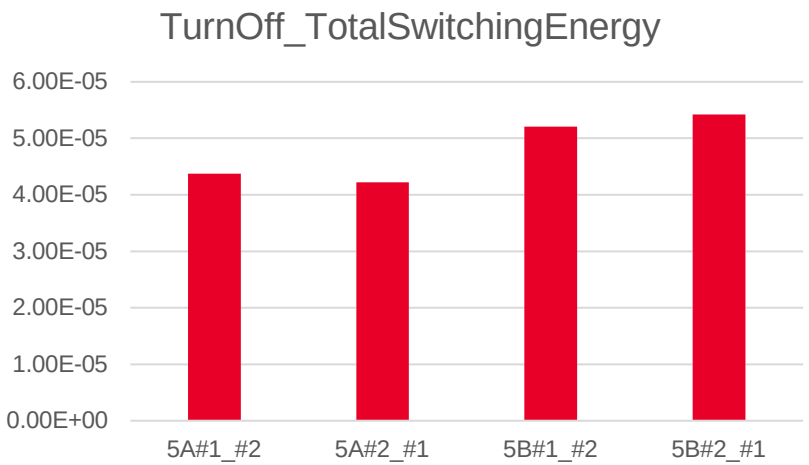










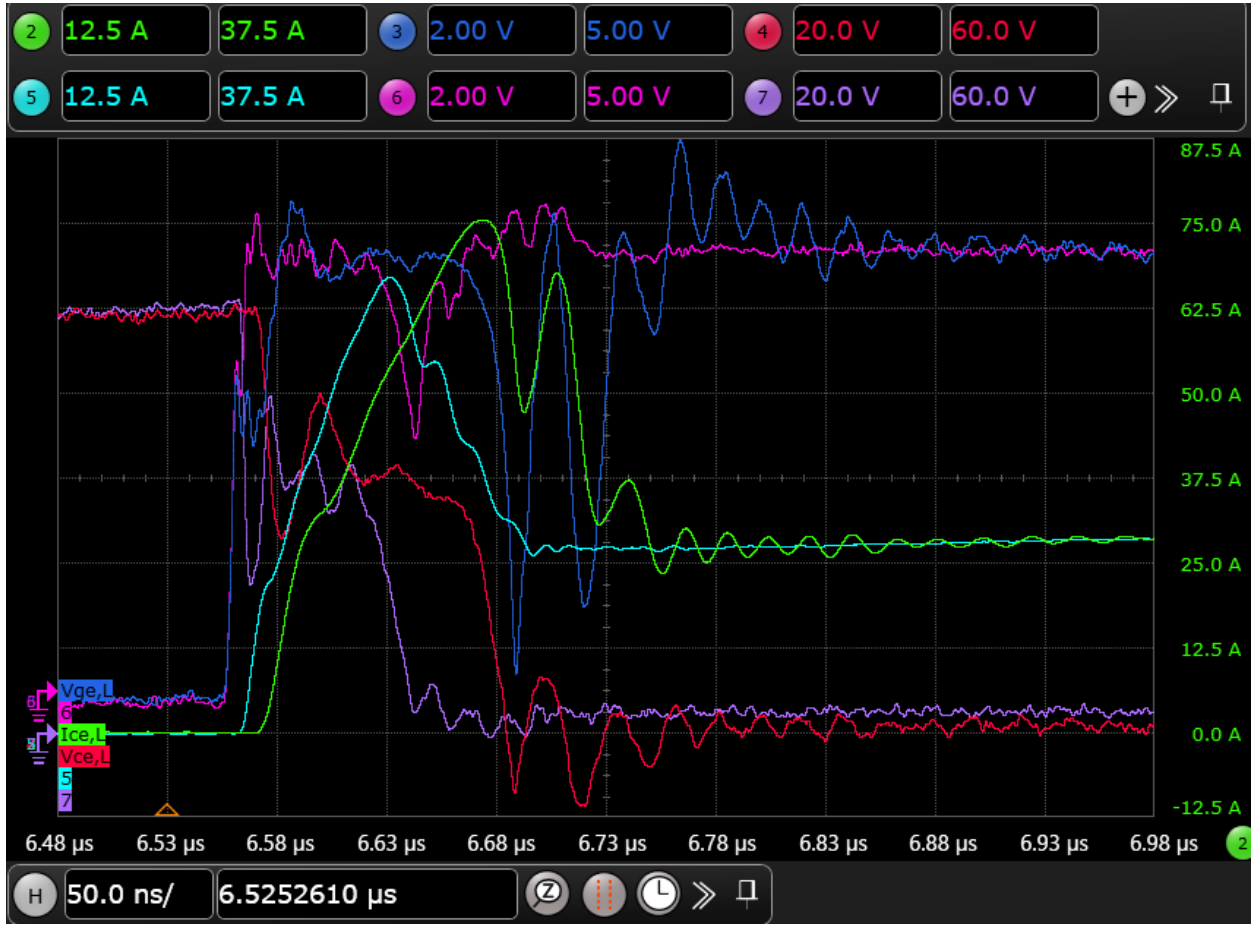


5A, 5B (IRFP260NPBF) Standard

Vds=100V, Ids=28A, RgL=2.5ohm, RgH=0ohm, Vgs=0 to 10V, IntLv 90-10%,

- Ch2,3,4 = 5A#1_#2, Ids, Vgs, Vds
- Ch5,6,7 = 5B#1_#2, Ids, Vgs, Vds

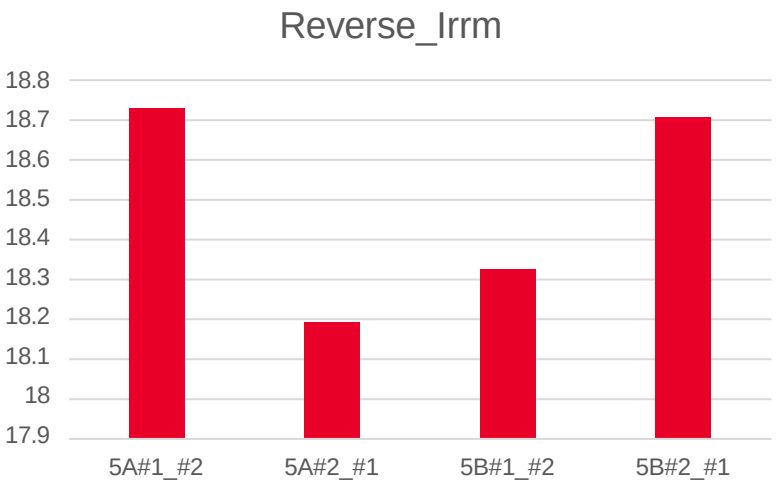
Turn OFF

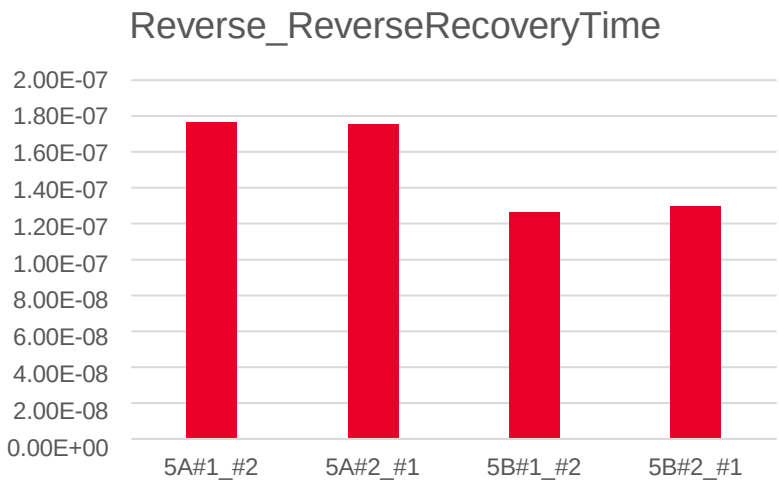


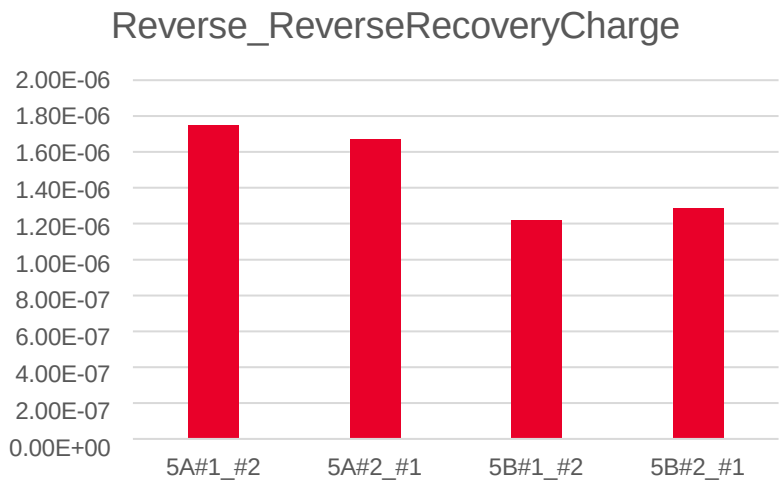
Turn ON

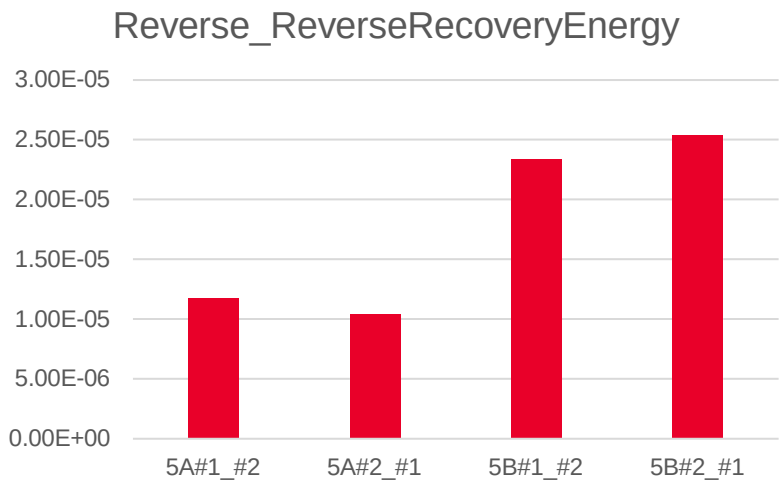
5A, 5B (IRFP260NPBF) RR

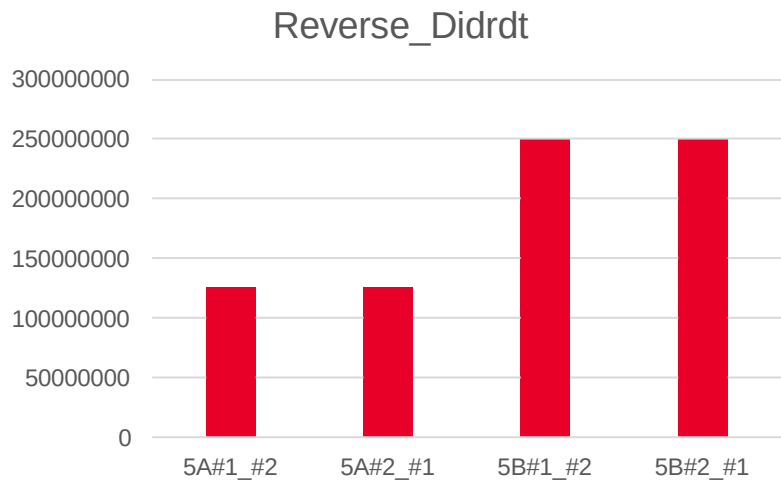
Vds=480V, Ids=24A, RgL=0ohm, RgH=400ohm, Vgs=0 to 13V











5A, 5B (IRFP260NPBF) RR

Vds=480V, Ids=24A, RgL=0ohm, RgH=400ohm, Vgs=0 to 13V

- Ch2,4 = 5A#1_#2, Ids, Vds
- Ch5,7 = 5B#1_#2, Ids, Vds