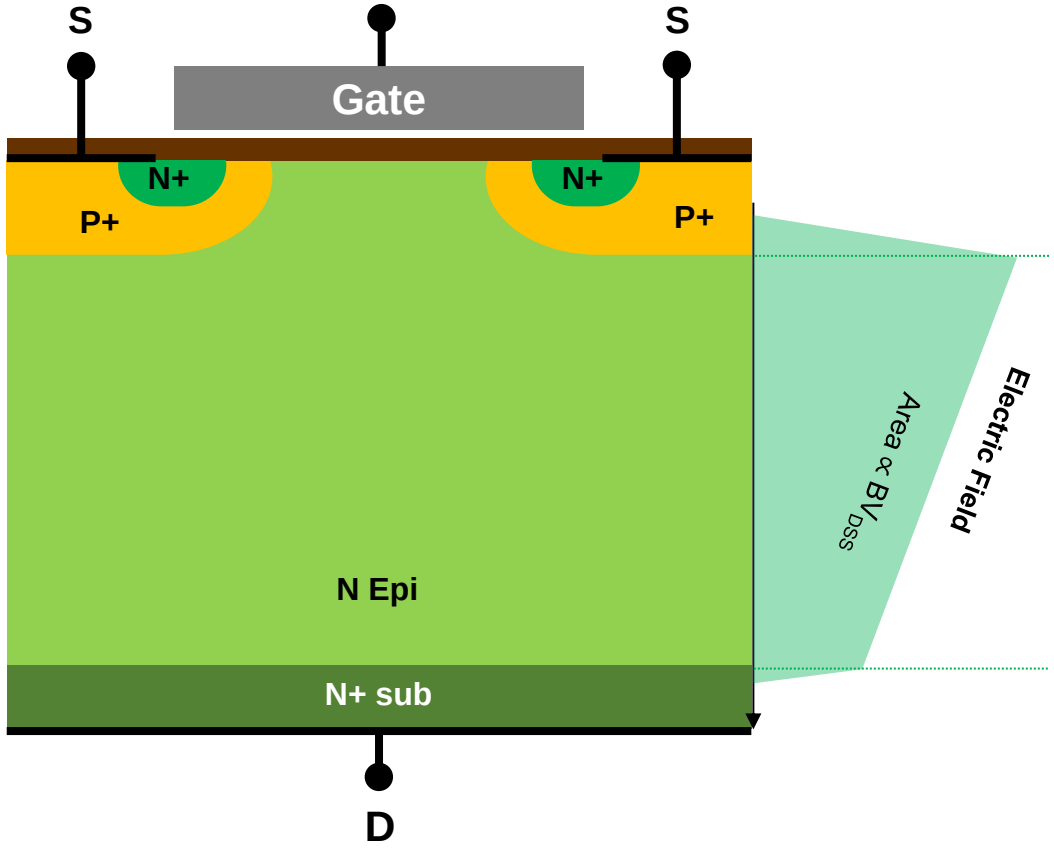
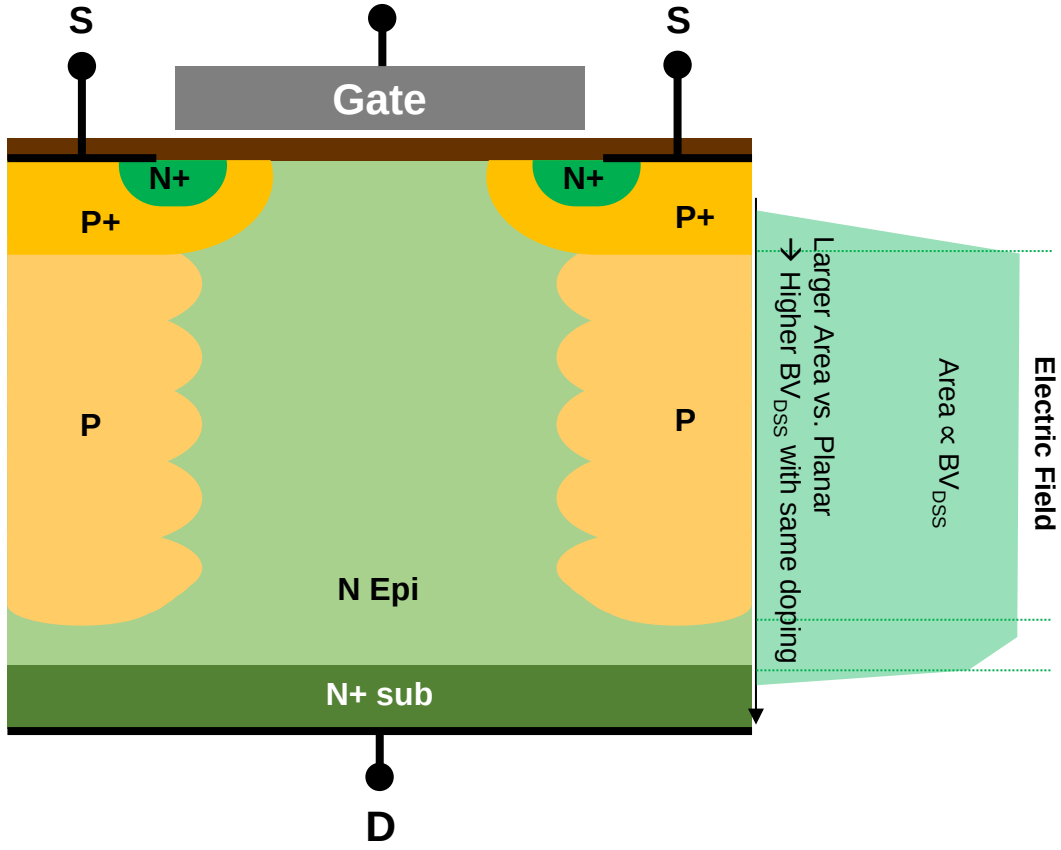
eMOS SJ MOSFET Selection Guide 2024

Advanced Faster Semiconductor's Silicon Carbide Technology

eMOS - Super Junction MOSFET Technology



Planar MOSFET



Super Junction MOSFET

- A linear relation between $R_{DS(ON)}$ and BV_{DSS}
- Lower $R_{DS(ON)}$ in same die size
- Smaller die size in same $R_{DS(ON)}$
- Low capacitance → Lower switching losses

SJ *e*MOS Product Strategy

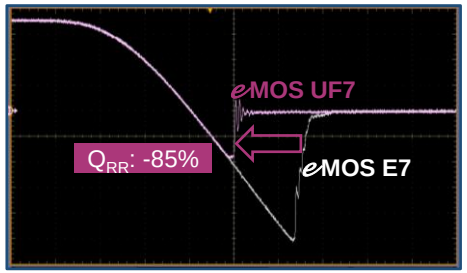
PFC
(Hard Switching)

LLC / ZVS (DC-DC)
(Soft Switching)

Low EMI / Easy to design / High Performance

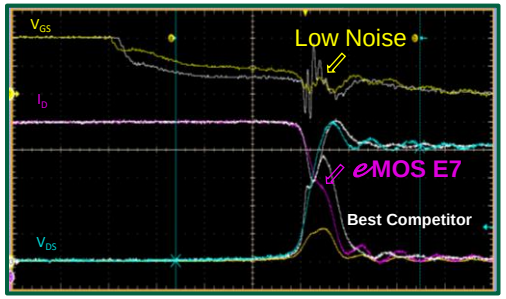
***e*MOS UF7** by controlling carrier lifetime

Soft Switching Topologies
- Robust diode ruggedness
- Smaller Q_{RR} for lower spikes
- Better system reliability
- Reduced E_{DYN}
- Typ. V_{TH}=4V



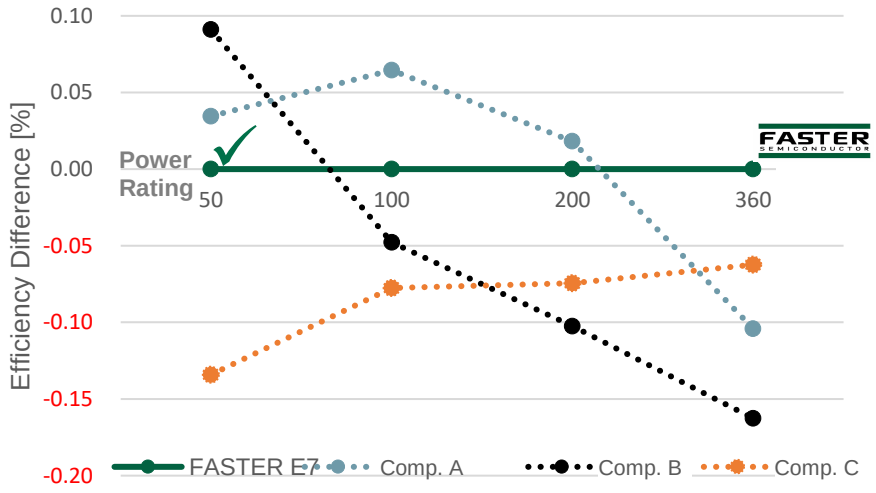
***e*MOS E7** by optimizing charge balance of pillar

Hard/Soft Switching Topologies
- Optimized balance between efficiency & easy of use
- Low EMI noise, optimized gate & drain ringing
- Rugged Body diode
- Internal R_G & optimized Capacitances
- Typ. V_{TH}=3.5V

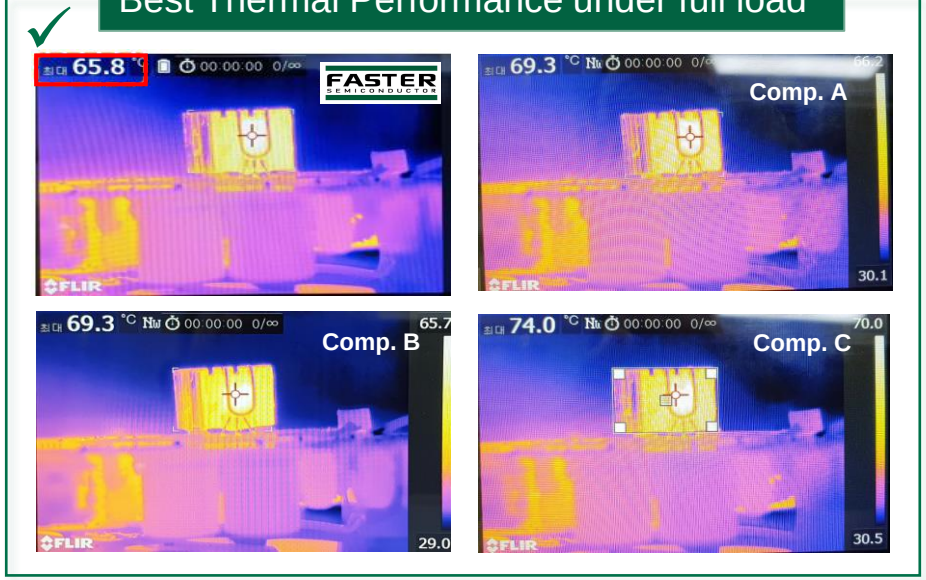


600V / 180mΩ *e*MOS E7 Benchmark
Well Balanced Performance

Efficiency: Close to Best Performance



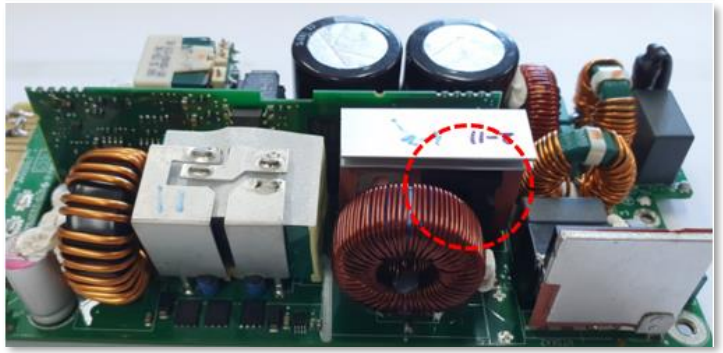
Best Thermal Performance under full load



Efficiency Comparison

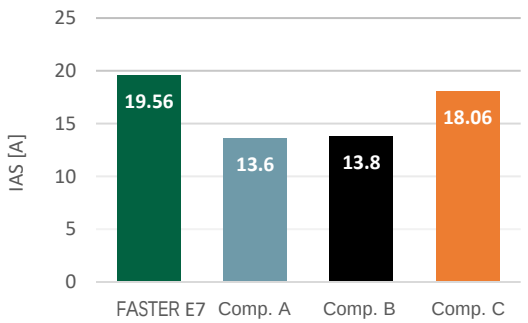
Power [W]	FASTER E7	Comp. A	Comp. B	Comp. C
50	86.17	86.20	86.03	86.26
100	89.92	89.98	89.84	89.87
200	92.57	92.58	92.49	92.46
360	91.11	91.01	91.05	90.95

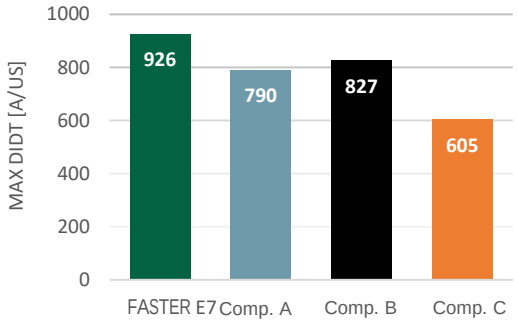
Application Board Information

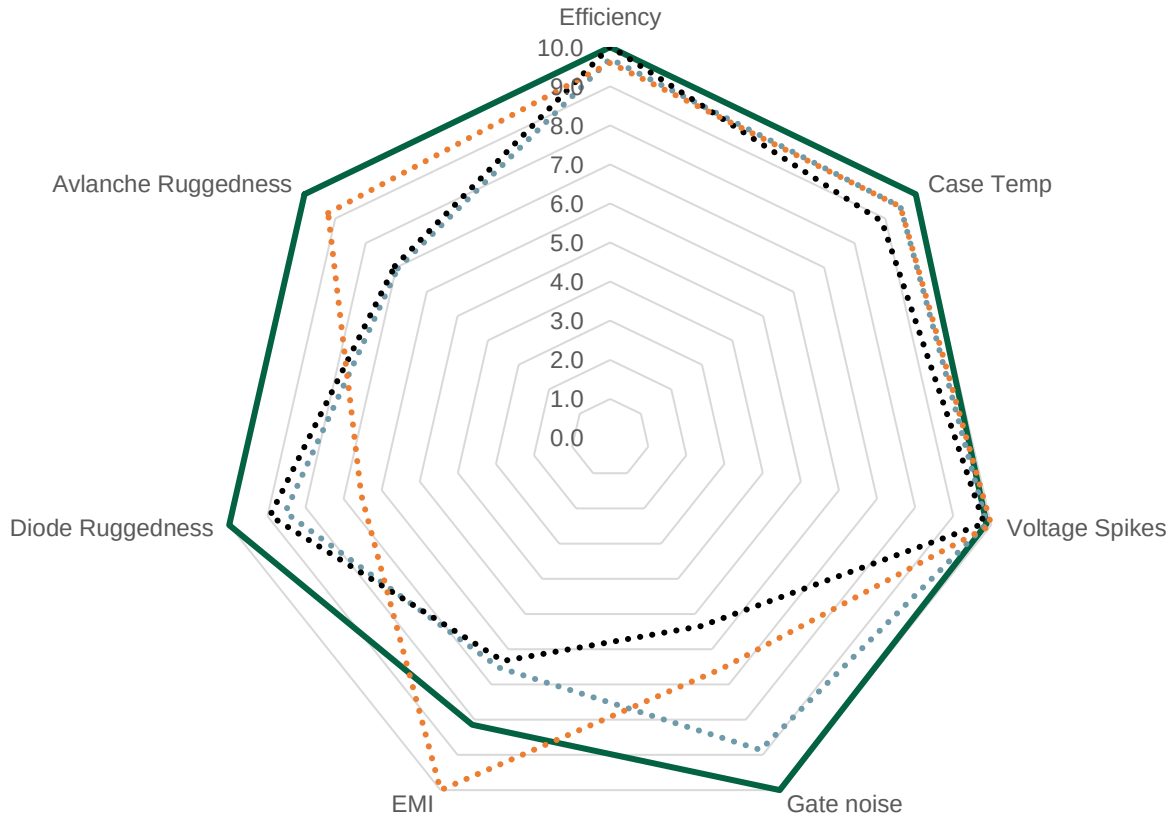


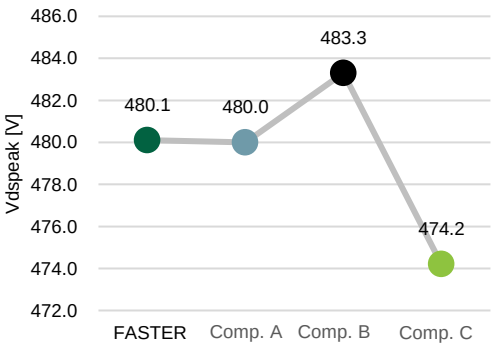
- Test Condition : 400W CCM PFC, V_{IN}=110V_{AC}, V_{OUT}=12V_{DC}, Boost diode : 650V/4A SiC diode, R_{ON}=12 Ω, R_{OFF}=3 Ω

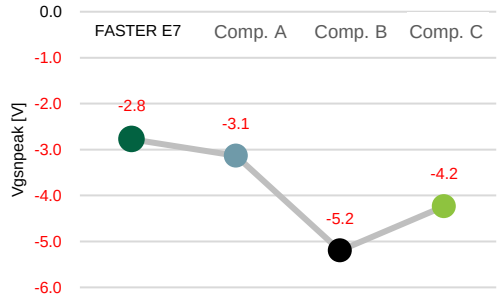
600V / 180mΩ *e*MOS E7 Benchmark
Well Balanced Performance









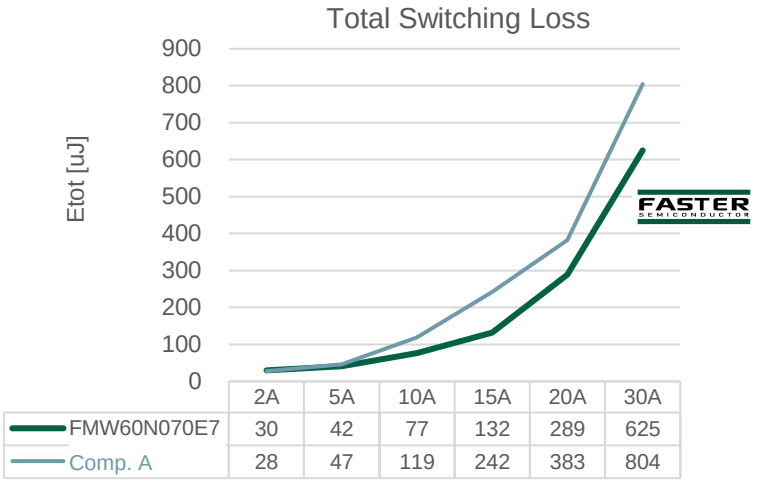


FASTER E7 (600V) Comp. A (600V) Comp. B (600V) Comp. C (650V)

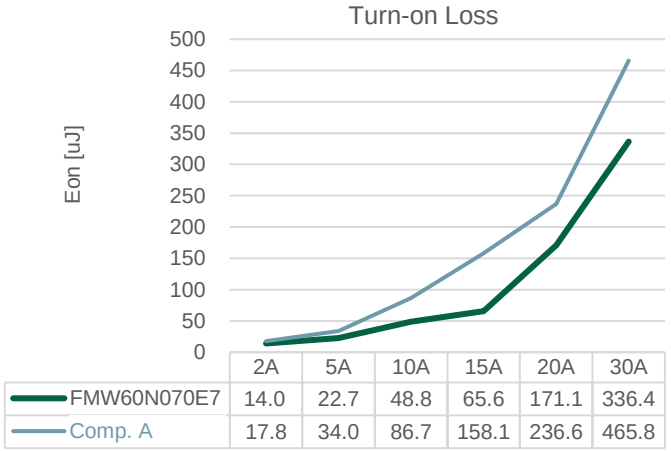
- Test Condition : 400W CCM PFC, V_{IN}=110V_{AC}, V_{OUT}=12V_{DC}, Boost diode : 650V/4A SiC diode, R_{ON}=12 Ω, R_{OFF}=3 Ω

600V / 70mΩ *e*MOS E7 Benchmark
Lower Switching Losses

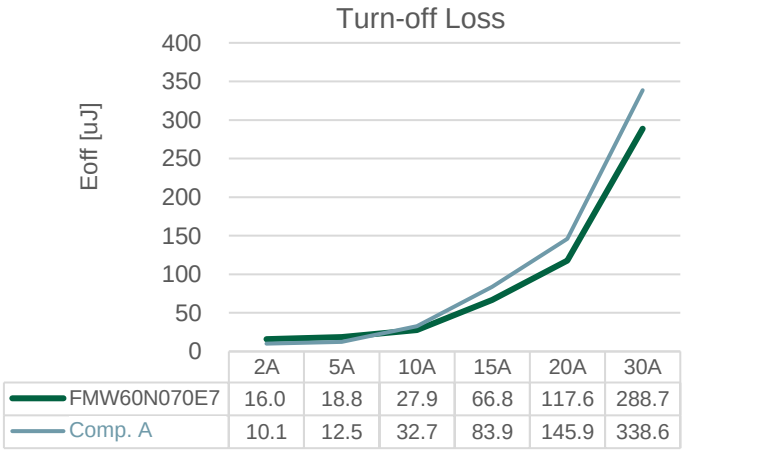
Lower Switching Loss against the best competitor



	2A	5A	10A	15A	20A	30A
FMW60N070E7	30	42	77	132	289	625
Comp. A	28	47	119	242	383	804



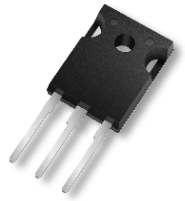
	2A	5A	10A	15A	20A	30A
FMW60N070E7	14.0	22.7	48.8	65.6	171.1	336.4
Comp. A	17.8	34.0	86.7	158.1	236.6	465.8

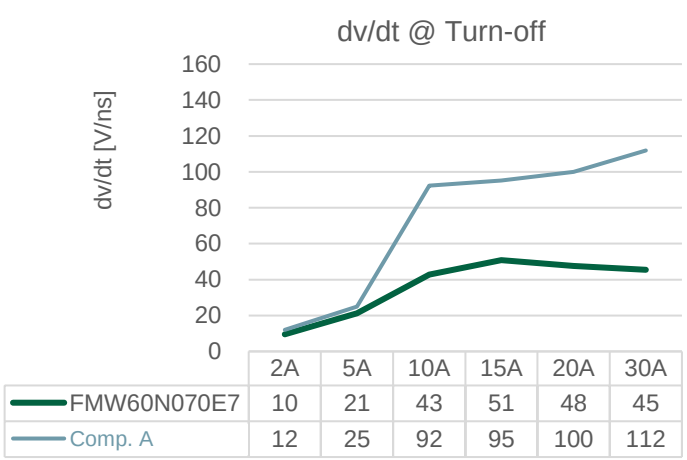


	2A	5A	10A	15A	20A	30A
FMW60N070E7	16.0	18.8	27.9	66.8	117.6	288.7
Comp. A	10.1	12.5	32.7	83.9	145.9	338.6

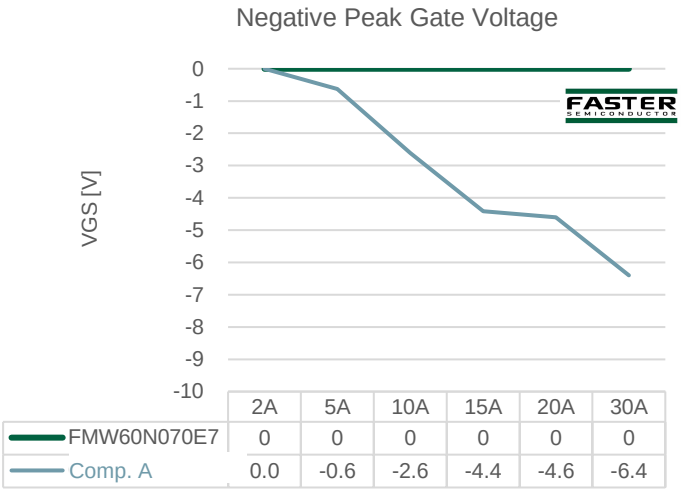
- Test Condition ; V_{DD}=400V_{DC}, V_{GS}=10V, Ext.R_G=4.7Ω, L=390μH

600V / 70mΩ *e*MOS E7 Benchmark
Lower Switching Noise

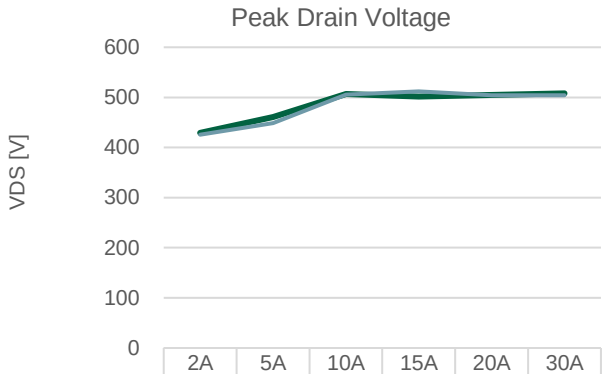




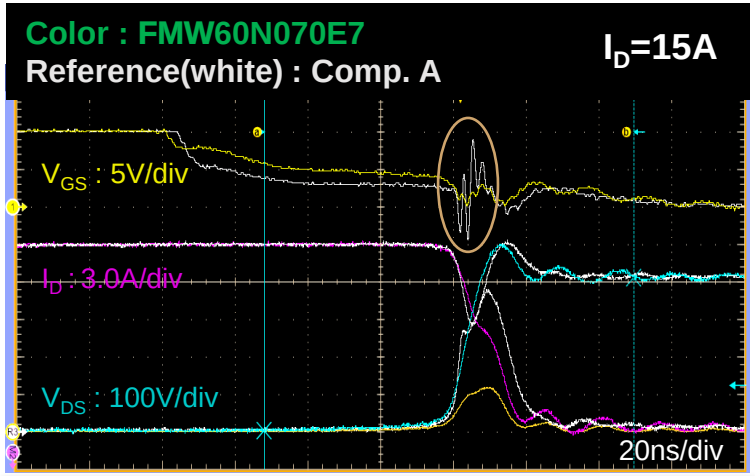
	2A	5A	10A	15A	20A	30A
FMW60N070E7	10	21	43	51	48	45
Comp. A	12	25	92	95	100	112



	2A	5A	10A	15A	20A	30A
FMW60N070E7	0	0	0	0	0	0
Comp. A	0.0	-0.6	-2.6	-4.4	-4.6	-6.4



	2A	5A	10A	15A	20A	30A
FMW60N070E7	429	461	507	502	505	508
Comp. A	426	448	505	512	504	504



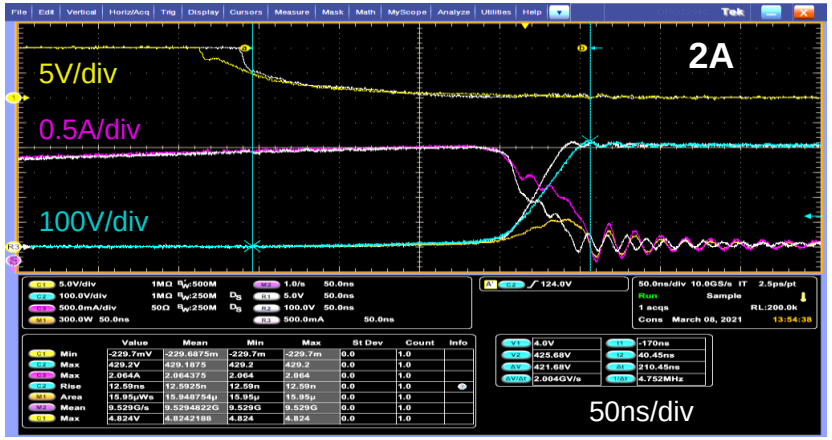
Lower Switching Noise against the best competitor

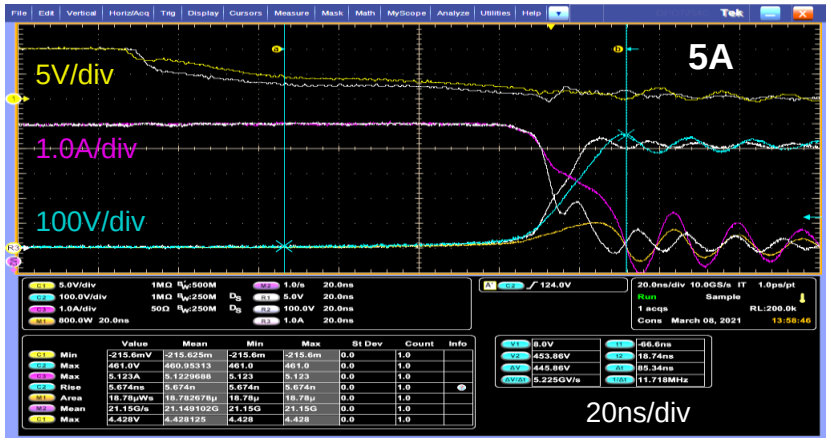
- Test Condition ; V_{DD}=400V_{DC}, V_{GS}=10V, Ext.R_G=4.7Ω, L=390μH

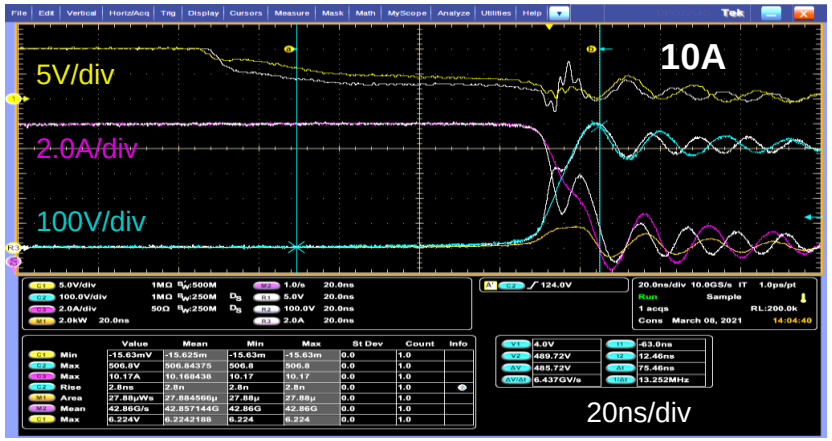
600V / 70mΩ *e*MOS E7 Benchmark
Lower Switching Noise

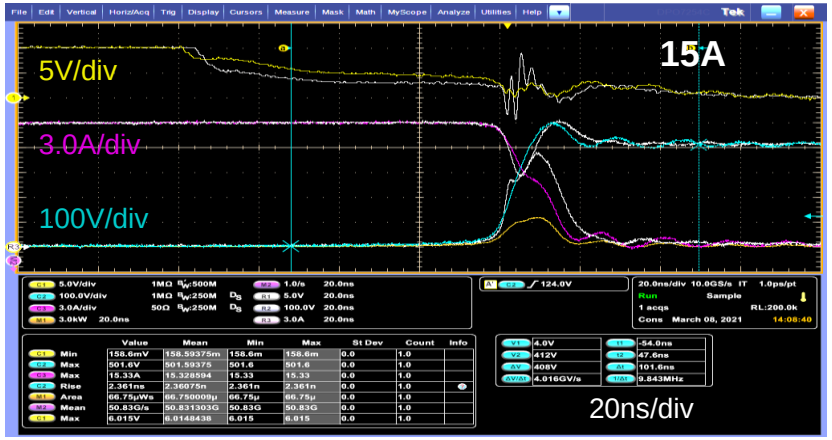
FMW60N070E7 : Turn-off SW waveforms without voltage oscillation !!!

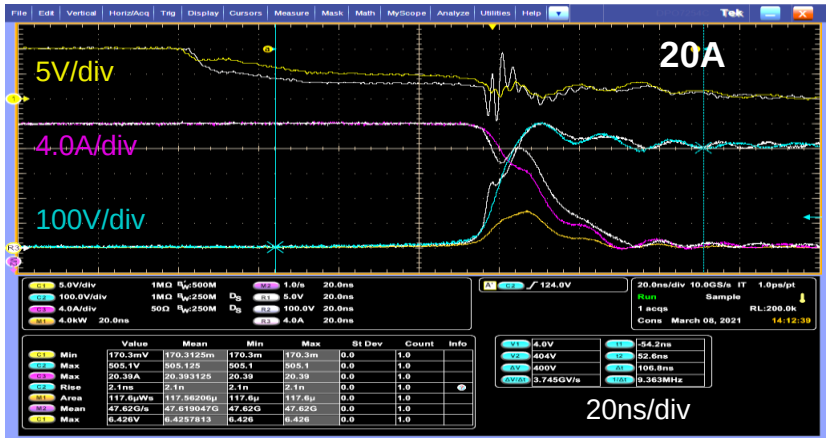
Color : FMW60N070E7 / Reference(white) : Comp. A

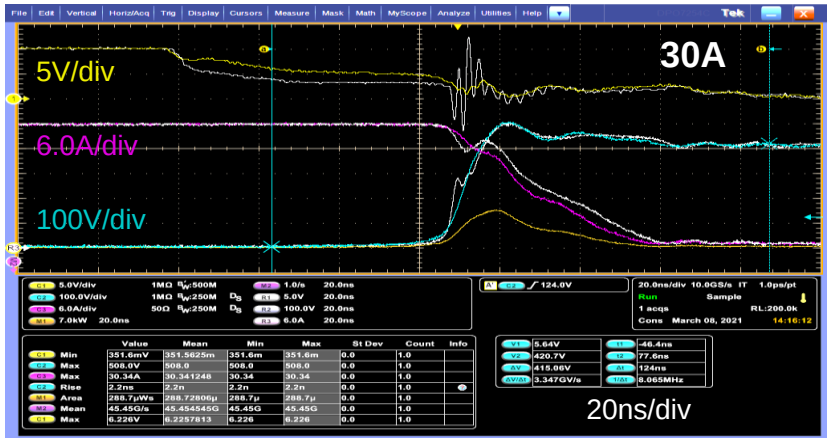








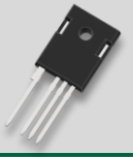




600V/650V eMOS E7 MOSFET Portfolio

Available now
On Planning [Release Target]

Adaptor | ATX Power | Class-D Audio | TV / LED Lighting | Solar | Server / Telecom | UPS | EV Charger | EV(OBC)

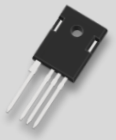
	Package / $R_{DS(ON)\_max}$	Die	DPAK	PQFN88	TOLL	TO-220	TO-220F	TO-247 3L	TO-247 4L
									
600V	28mΩ							FMW60N028E7	FMZ60N028E7
	40mΩ	FMO60N040E7						FMW60N040E7	
	70mΩ	FMO60N070E7						FMW60N070E7	
	99mΩ	FMO60N099E7				FMP60N099E7	FMF60N099E7	FMW60N099E7	
	105mΩ			FML60N105E7	FMT60N105E7				
	180mΩ	FMO60N180E7				FMP60N180E7	FMF60N180E7		
	280mΩ	FMO60N280E7	FMD60N280E7			FMP60N280E7	FMF60N280E7		
	380mΩ	FMO60N380E7	FMD60N380E7			FMP60N380E7	FMF60N380E7		
	600mΩ	FMO60N600E7	FMD60N600E7				FMF60N600E7		
650V	180mΩ	FMO65N180E7					FMF65N180E7		
	280mΩ	FMO65N280E7					FMF65N280E7		
	380mΩ	FMO65N380E7					FMF65N380E7		
	600mΩ	FMO65N600E7					FMF65N600E7		
	1200mΩ	FMO65N12KE7							

600V/650V eMOS UF7 MOSFET Portfolio

Adaptor | ATX Power | Class-D Audio | TV / LED Lighting | Solar | Server / Telecom | UPS | EV Charger | EV(OBC)

	Package / $R_{DS(ON)\_max}$	Die	DPAK	PQFN88	TO-220	TO-220F	TO-247 3L
							
600V	30mΩ	FMO60N030UF7					FMW60N030UF7
	43mΩ	FMO60N043UF7					FMW60N043UF7
	75mΩ	FMO60N075UF7					FMW60N075UF7
	105mΩ	FMO60N105UF7					FMW60N105UF7
	193mΩ	FMO60N193UF7				FMF60N193UF7	
650V	45mΩ	FMO65N045UF7					FMW65N045UF7
	310mΩ	FMO65N310UF7					
	645mΩ	FMO65N645UF7					

FASTER *e*MOS E7 & UF7MOSFET Product Portfolio

Voltage / $R_{DS(ON)\_max}$		*e*MOS E7							*e*MOS UF7				
Qualification / Package		DPAK	PQFN88	TOLL	TO-220	TO-220F	TO-247 3L	TO-247 4L	DPAK	PQFN88	TO-220	TO-220F	TO-247 3L
													
600V	28mΩ						FMW60N028E7	FMZ60N028E7					
	30mΩ												FMW60N030UF7
	40mΩ						FMW60N040E7						
	43mΩ												FMW60N043UF7
	70mΩ						FMW60N070E7						
	75mΩ												FMW60N075UF7
	99mΩ				FMP60N099E7	FMF60N099E7	FMW60N099E7						
	105mΩ		FML60N105E7	FMT60N105E7									FMW60N105UF7
	180mΩ				FMP60N180E7	FMF60N180E7							
	193mΩ											FMF60N193UF7	
	280mΩ	FMD60N280E7			FMP60N280E7	FMF60N280E7							
	380mΩ	FMD60N380E7			FMP60N380E7	FMF60N380E7							
	600mΩ	FMD60N600E7				FMF60N600E7							
650V	45mΩ												FMW65N045UF7
	180mΩ					FMF65N180E7							
	280mΩ					FMF65N280E7							
	380mΩ					FMF65N380E7							
	600mΩ					FMF65N600E7							
	1200mΩ												

Ordering System (SJ MOSFET)