

**POWERMASTER**  
SEMICONDUCTOR

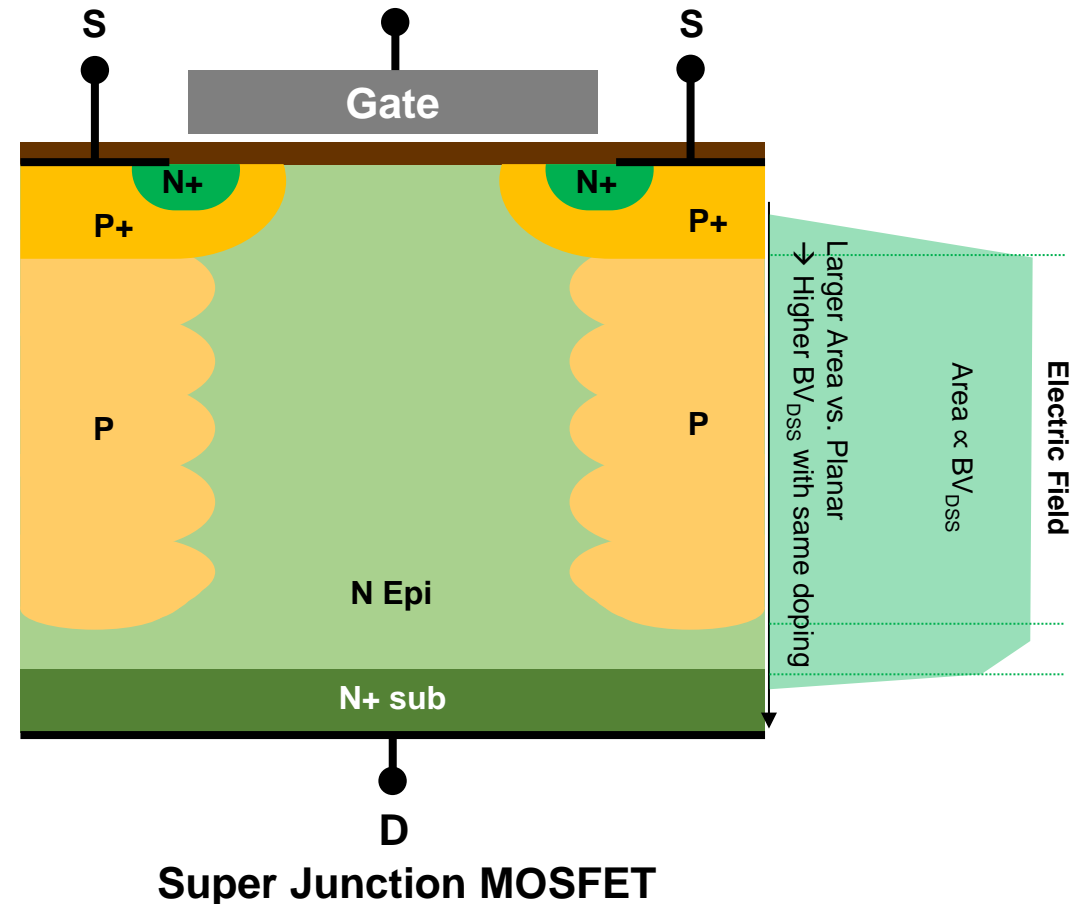
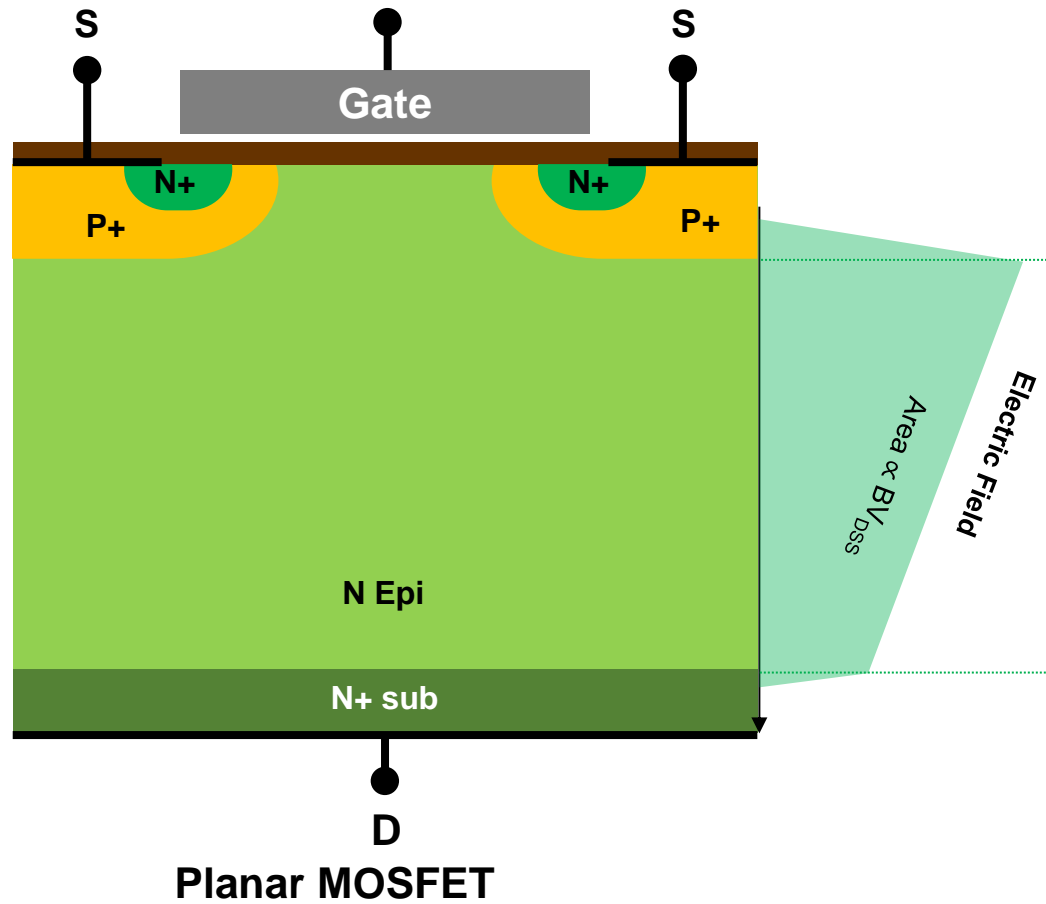
Masters of Power Solution



# *e*MOS SJ MOSFET Selection Guide 2024

Advanced Power Master Semiconductor's Silicon Carbide Technology

# eMOS - Super Junction MOSFET Technology



- 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)



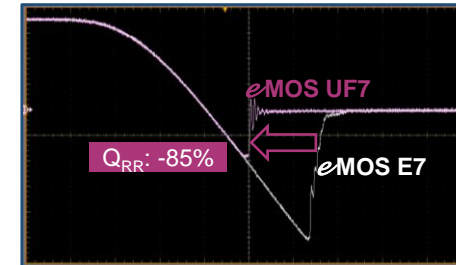
LLC / ZVS (DC-DC)  
(Soft Switching)



*e*MOS UF7 by controlling  
carrier lifetime

## Soft Switching Topologies

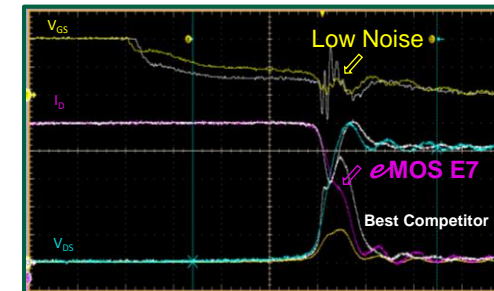
- Robust diode ruggedness
- Smaller  $Q_{RR}$  for lower spikes
- Better system reliability
- Reduced  $E_{DYN}$
- Typ.  $V_{TH}=4V$



*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.  $V_{TH}=3.5V$

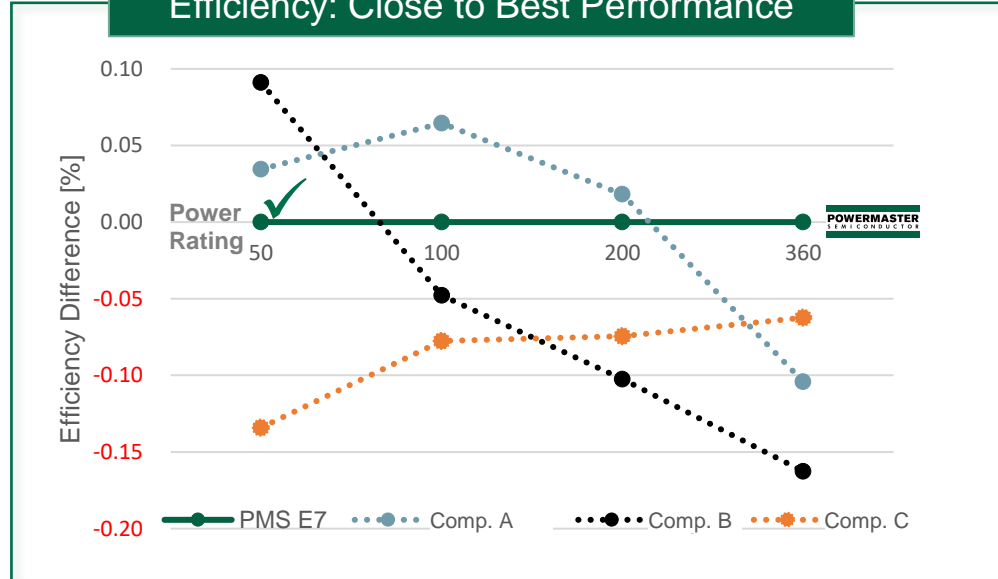


Low EMI / Easy to design / High Performance

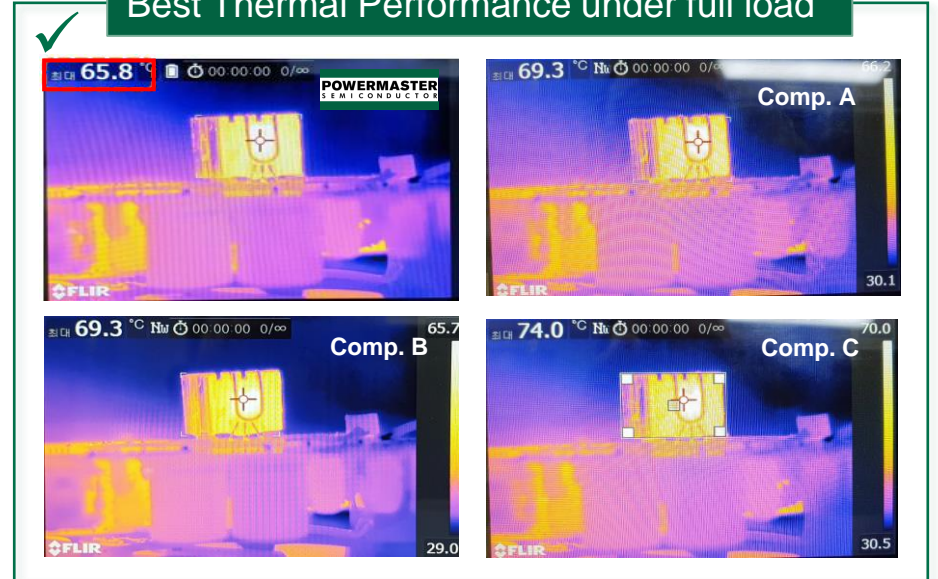
# 600V / 180mΩ *e*MOS E7 Benchmark

## Well Balanced Performance

### Efficiency: Close to Best Performance



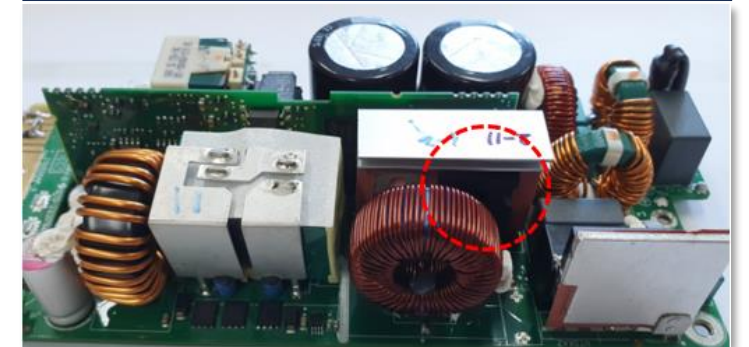
### Best Thermal Performance under full load



### Efficiency Comparison

Power [W]	PMS 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

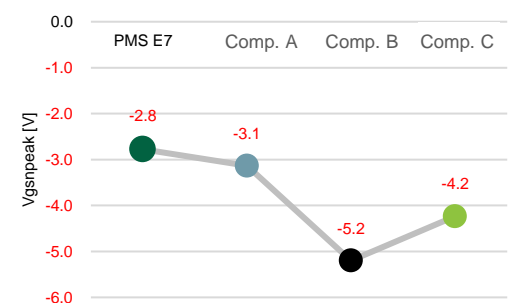
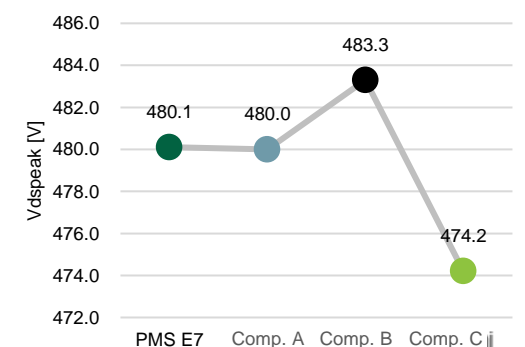
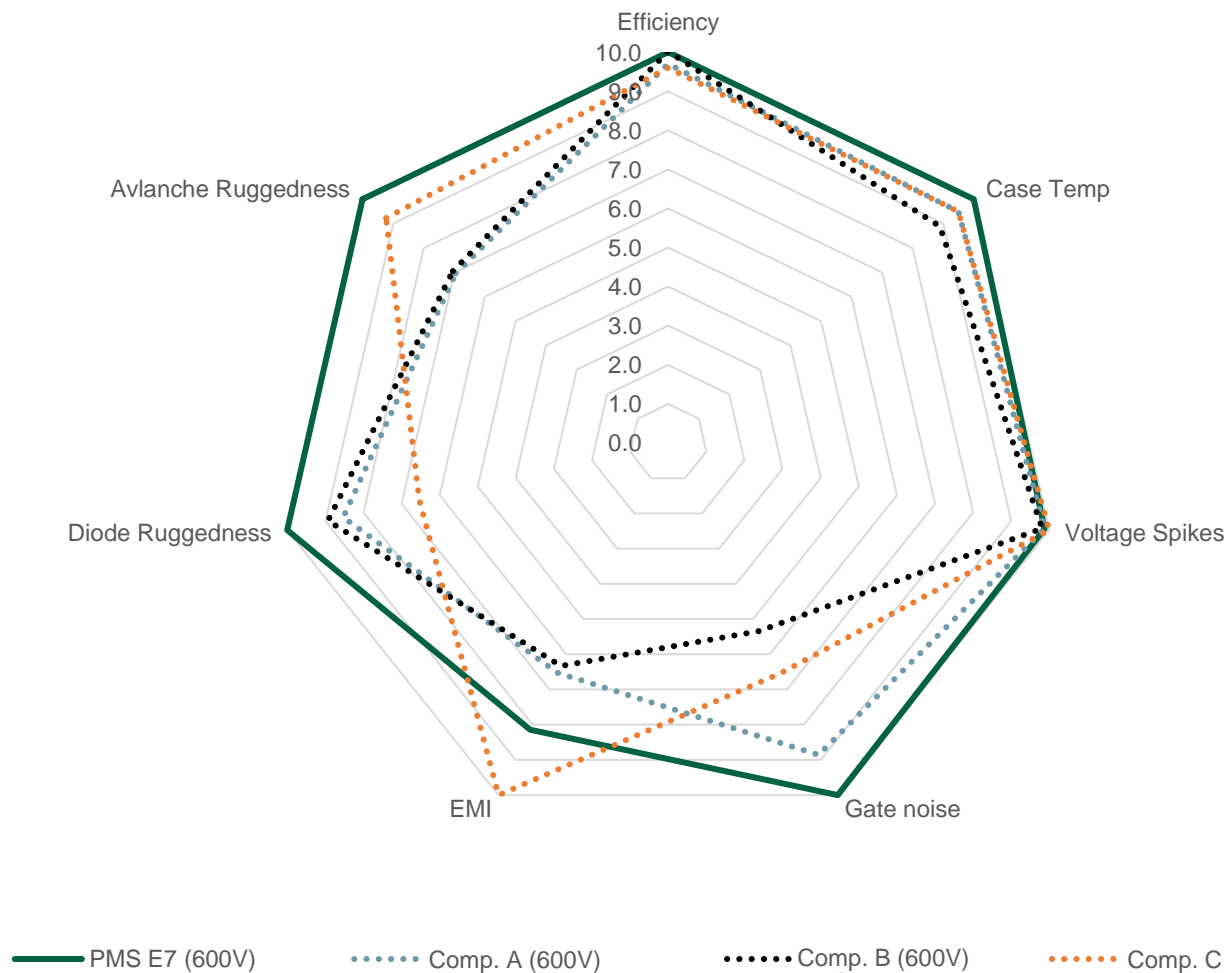
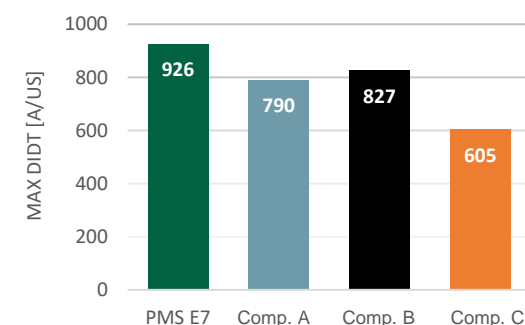
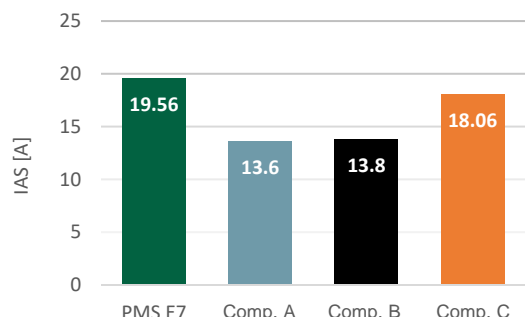
### Application Board Information



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

# 600V / 180mΩ *e*MOS E7 Benchmark

## Well Balanced Performance

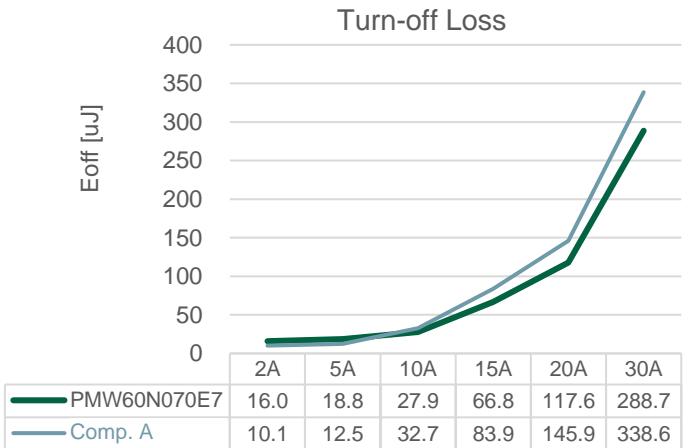
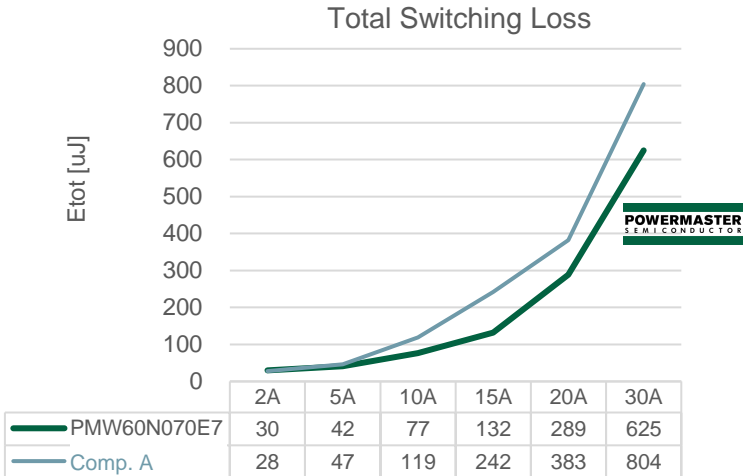
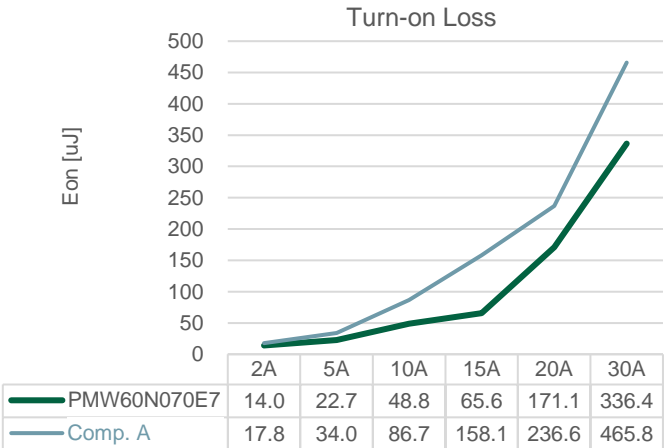


▪ Test Condition : 400W CCM PFC, V<sub>IN</sub>=110V<sub>AC</sub>, V<sub>OUT</sub>=12V<sub>DC</sub>, Boost diode : 650V/4A SiC diode, R<sub>ON</sub>=12 Ω, R<sub>OFF</sub>=3 Ω

# 600V / 70mΩ *e*MOS E7 Benchmark

## Lower Switching Losses

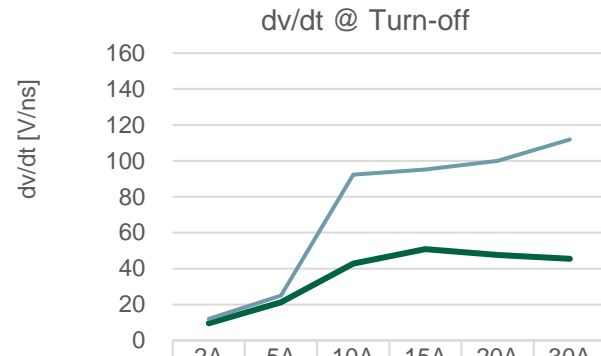
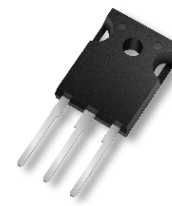
Lower Switching Loss against the best competitor



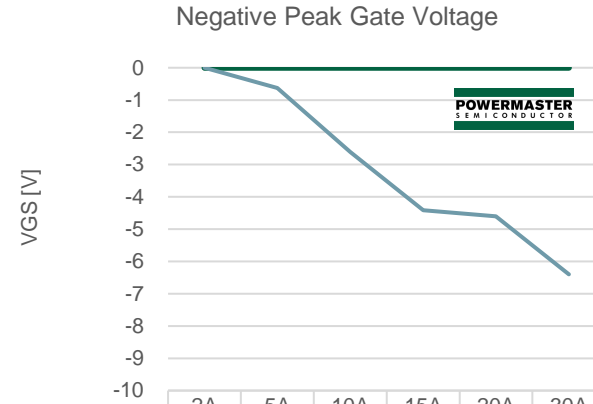
Test Condition ;  $V_{DD}=400V_{DC}$ ,  $V_{GS}=10V$ ,  $Ext.R_G=4.7\Omega$ ,  $L=390\mu H$

# 600V / 70mΩ *e*MOS E7 Benchmark

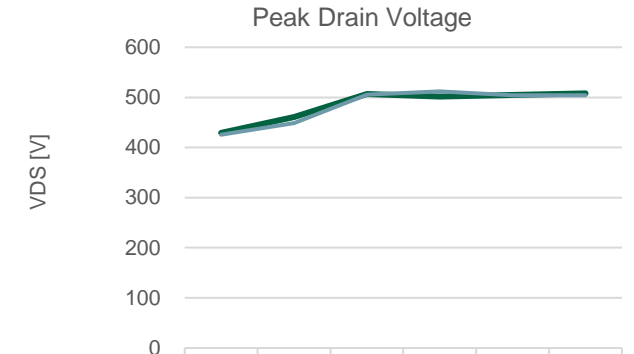
## Lower Switching Noise



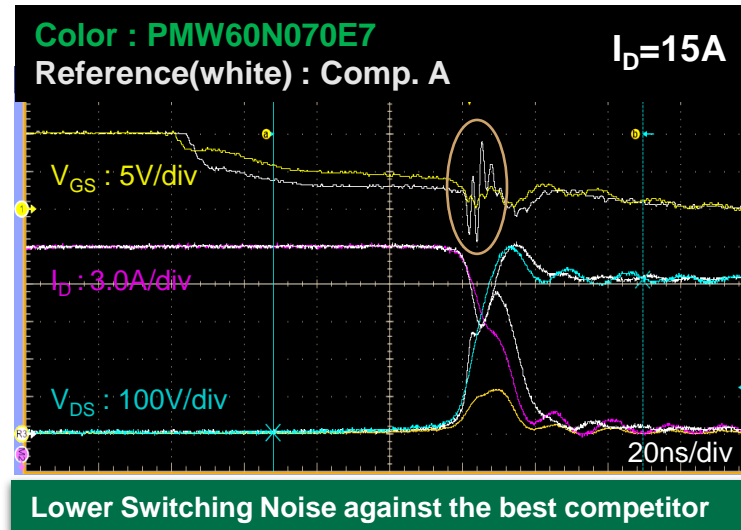
	2A	5A	10A	15A	20A	30A
PMW60N070E7	10	21	43	51	48	45
Comp. A	12	25	92	95	100	112



	2A	5A	10A	15A	20A	30A
PMW60N070E7	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
PMW60N070E7	429	461	507	502	505	508
Comp. A	426	448	505	512	504	504



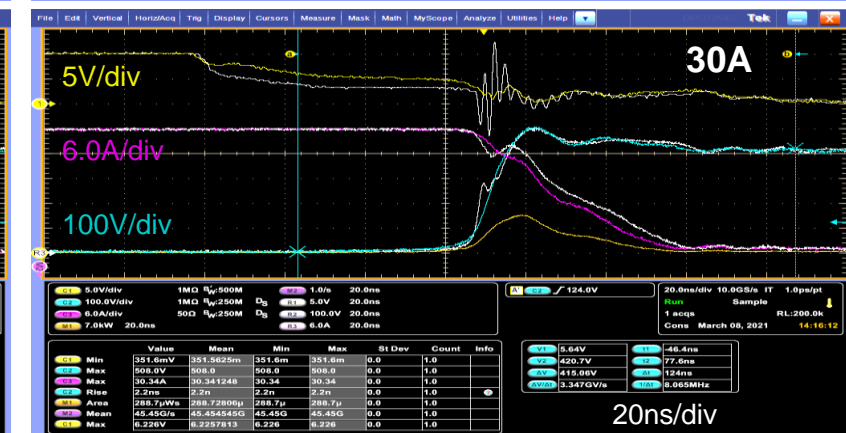
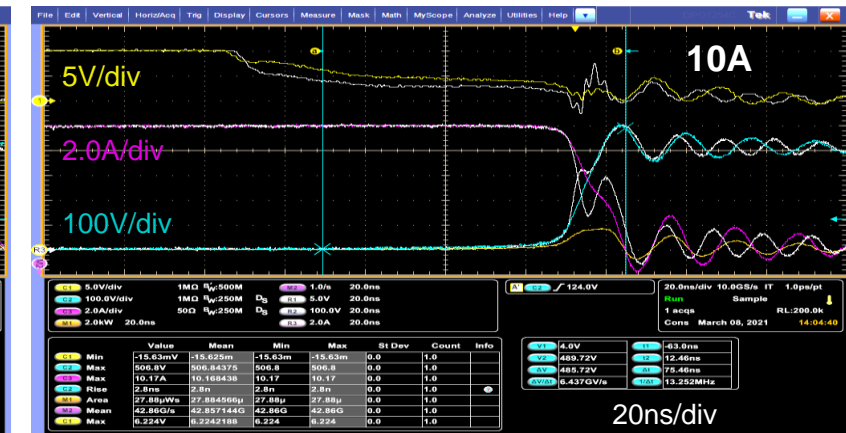
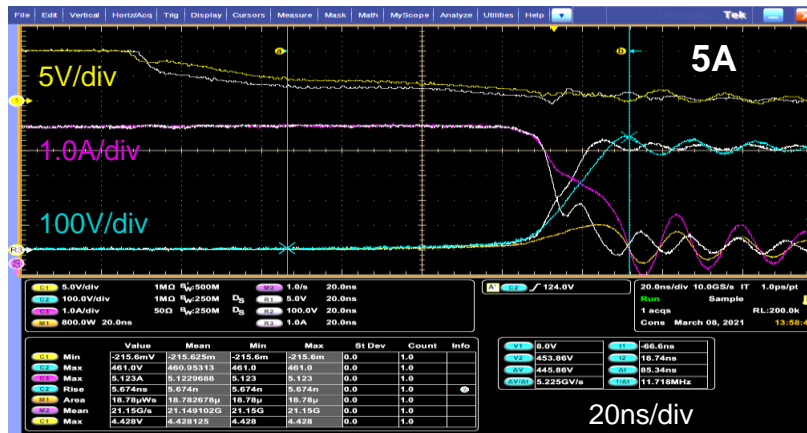
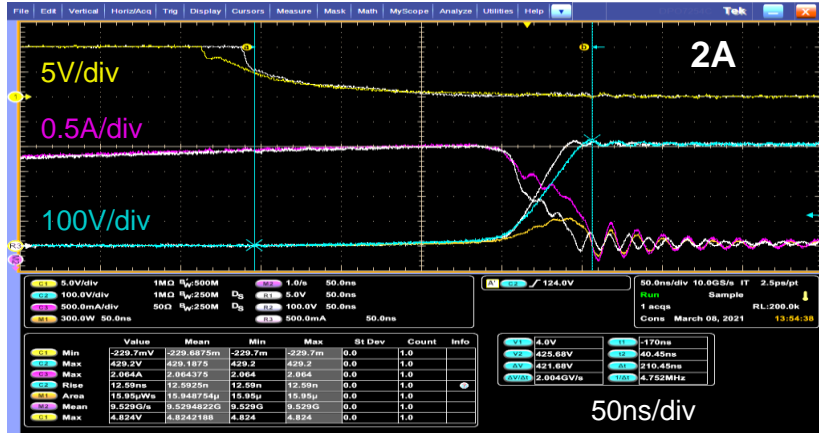
Test Condition ;  $V_{DD}=400V_{DC}$ ,  $V_{GS}=10V$ , Ext. $R_G=4.7\Omega$ ,  $L=390\mu H$

# 600V / 70mΩ *e*MOS E7 Benchmark

## Lower Switching Noise

### PMW60N070E7 : Turn-off SW waveforms without voltage oscillation !!!

Color : PMW60N070E7 / Reference(white) : Comp. A





# 600V/650V eMOS E7 MOSFET Portfolio

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Available now  
On Planning [ Release Target ]



Package	Die	PAK	PQFN88	TOLL	TO-220	TO-220F	TO-247 3L	TO-247 4L
<b>600V</b>	$R_{DS(ON)_{max}}$							
28mΩ	PMO60N028E7						PMW60N028E7	PMZ60N028E7
40mΩ	PMO60N040E7						PMW60N040E7	
70mΩ	PMO60N070E7						PMW60N070E7	
99mΩ	PMO60N099E7				PMP60N099E7	PMF60N099E7	PMW60N099E7	
105mΩ			PML60N105E7	PMT60N105E7				
180mΩ	PMO60N180E7				PMP60N180E7	PMF60N180E7		
280mΩ	PMO60N280E7	PMD60N280E7			PMP60N280E7	PMF60N280E7		
380mΩ	PMO60N380E7	PMD60N380E7			PMP60N380E7	PMF60N380E7		
600mΩ	PMO60N600E7	PMD60N600E7				PMF60N600E7		
<b>650V</b>	180mΩ	PMO65N180E7				PMF65N180E7		
	280mΩ	PMO65N280E7				PMF65N280E7		
	380mΩ	PMO65N380E7				PMF65N380E7		
	600mΩ	PMO65N600E7				PMF65N600E7		
	1200mΩ	PMO65N12KE7						

# 600V/650V eMOS UF7 MOSFET Portfolio

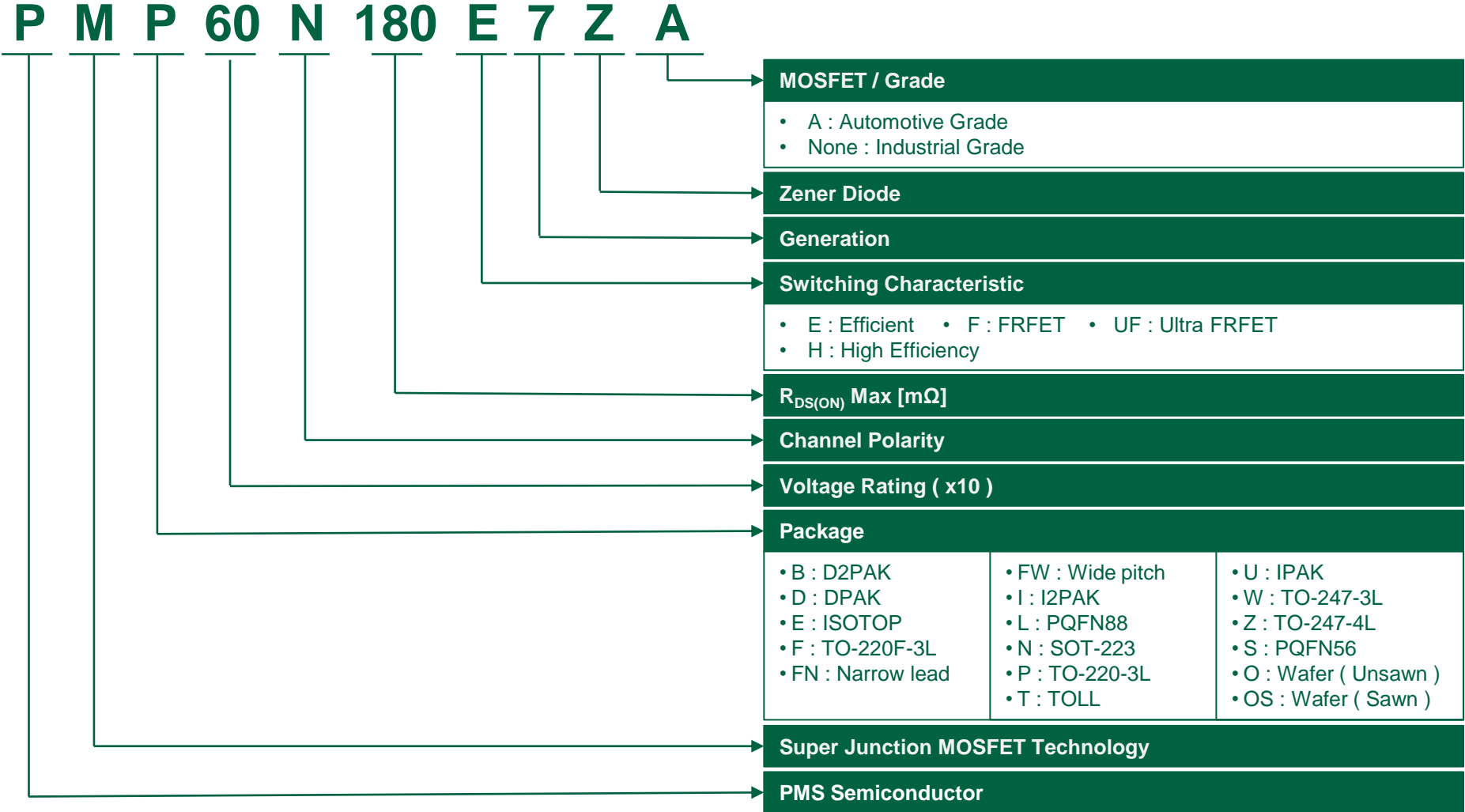


		Package	Die	DPAK	PQFN88	TO-220	TO-220F	TO-247 3L
		$R_{DS(ON)_{max}}$						
600V	30mΩ	PMO60N030UF7						PMW60N030UF7
	43mΩ	PMO60N043UF7						PMW60N043UF7
	75mΩ	PMO60N075UF7						PMW60N075UF7
	105mΩ	PMO60N105UF7						PMW60N105UF7
	193mΩ	PMO60N193UF7						PMF60N193UF7
650V	45mΩ	PMO65N045UF7						PMW65N045UF7
	310mΩ	PMO65N310UF7						
	645mΩ	PMO65N645UF7						

# PMS *e*MOS E7 & UF7 MOSFET Product Portfolio

Qualification / Package		<i>e</i> MOS E7						<i>e</i> MOS UF7						
		DPAK	PQFN88	TOLL	TO-220	TO-220F	TO-247 3L	TO-247 4L	DPAK	PQFN88	TO-220	TO-220F	TO-247 3L	
600V	28mΩ													
	30mΩ						PMW60N028E7	PMZ60N028E7						
	40mΩ						PMW60N040E7							
	43mΩ												PMW60N043UF7	
	70mΩ						PMW60N070E7							
	75mΩ												PMW60N075UF7	
	99mΩ				PMP60N099E7	PMF60N099E7	PMW60N099E7							
	105mΩ		PML60N105E7	PMT60N105E7										PMW60N105UF7
	180mΩ				PMP60N180E7	PMF60N180E7								
	193mΩ												PMF60N193UF7	
	280mΩ	PMD60N280E7			PMP60N280E7	PMF60N280E7								
	380mΩ	PMD60N380E7			PMP60N380E7	PMF60N380E7								
	600mΩ	PMD60N600E7				PMF60N600E7								
650V	45mΩ												PMW65N045UF7	
	180mΩ						PMF65N180E7							
	280mΩ						PMF65N280E7							
	380mΩ						PMF65N380E7							
	600mΩ						PMF65N600E7							
	1200mΩ													

# Ordering System ( SJ MOSFET )



The logo for Power Master Semiconductor features the word "POWERMASTER" in a large, bold, black sans-serif font. Below it, the word "SEMICONDUCTOR" is written in a smaller, all-caps, black sans-serif font, with each letter spaced out. The text is centered between two horizontal green bars.

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