

NexGen PN GaN Diode Replaces High Voltage 1200V SiC Diode in 1MHz, 800V Boost Application

This paper summarizes the evaluation of a 1200V NexGen GaN diode in NexGen’s 200V to 800V boost demonstration board switching at 1MHz. Performance was compared to a the 2A 1200V SiC diode from Infineon, part number IDM02G120C5, boost diode D7 in figure 1.

Efficiency was virtually identical with a softer forward conduction and less ringing with the NexGen device. Figure 3 waveforms include the switch node and the transistor and diode currents for the converter with both the Infineon SiC Schottky Diode and the NexGen’s GaN PN diode.

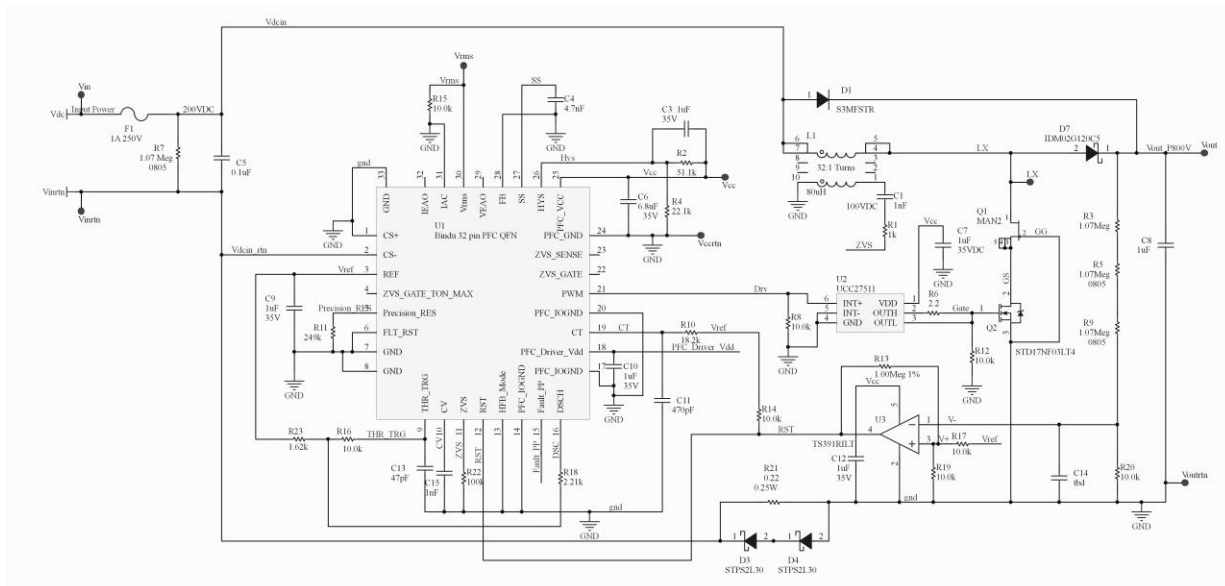


Figure 1: Boost Demo Schematic.

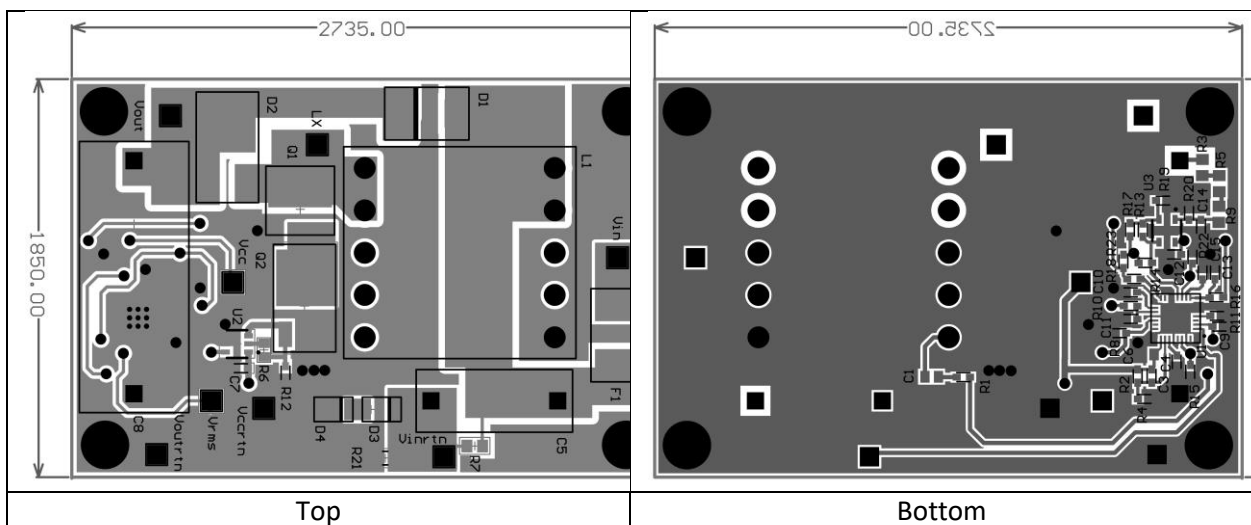


Figure 2: Board Layout Top (left) and Bottom (right)

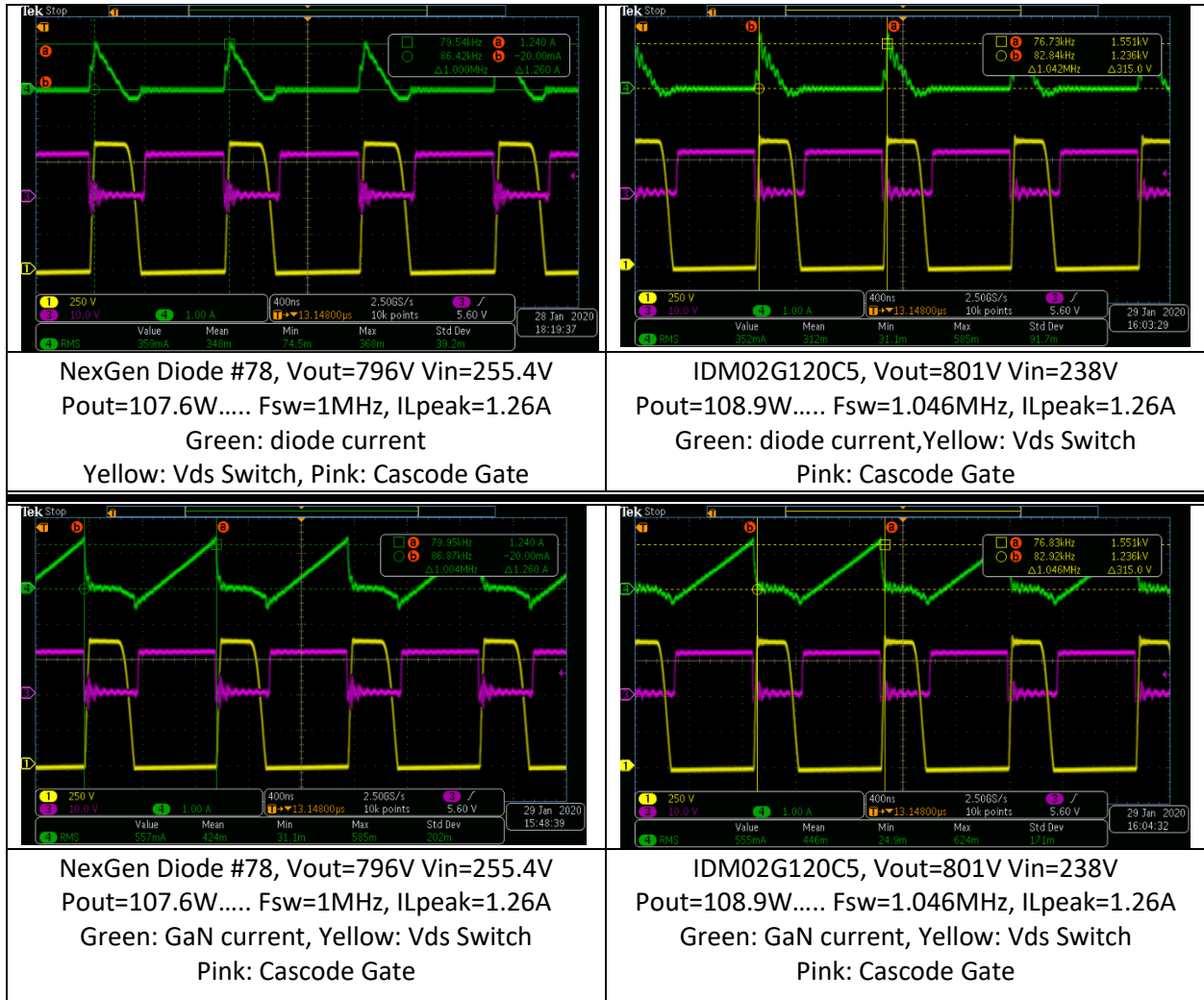


Figure 3. Waveforms.

Device	Vin (V)	Iin (mA)	Vout (V)	Iout (mA)	Pin (W)	Pout (W)	Ploss (W)	n (%)
Nexgen #A78	100	154	295	49.8	15.4	14.7	0.7	95.4
Nexgen #A78	150	244	455	77.3	36.6	35.2	1.4	96.1
Nexgen #A78	200	336	615	104.5	67.2	64.3	2.9	95.6
Nexgen #A78	238.4	407	740	125.6	97.0	92.9	4.1	95.8
Nexgen #A78	255.4	440	796	135.2	112.4	107.6	4.8	95.8
IDM02G120C5	238	477	801	136	113.5	108.9	4.6	96.0

Table 1. Efficiency Table



IDM02G120C5

5th Generation thinQ!™ 1200 V SiC Schottky Diode

Electrical Characteristics, at T_j=25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
DC blocking voltage	V _{DC}	T _j = 25°C	1200	-	-	V
Diode forward voltage	V _F	I _F = 2 A, T _j = 25°C	-	1.4	1.65	V
		I _F = 2 A, T _j = 150°C	-	1.7	2.30	
Reverse current	I _R	V _R = 1200 V, T _j = 25°C	-	1.2	18	μA
		V _R = 1200 V, T _j = 150°C	-	6	90	

AC Characteristics, at T_j=25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Total capacitive charge	Q _C	V _R = 800 V, T _j = 150°C	-	14	-	nC
		$Q_C = \int_0^{V_Z} C(V) dV$				
Total Capacitance	C	V _R = 1 V, f = 1 MHz	-	182	-	pF
		V _R = 400 V, f = 1 MHz	-	13	-	
		V _R = 800 V, f = 1 MHz	-	10	-	

Figure 2. IDM02G120C5 Diode Summary

Summary

Further study is needed to better understand what appears to be a softer forward recovery with NexGen’s diode. Otherwise, there is no significant performance between the Infineon SiC Schottky diode or NexGen’s GaN PN diode when used as a boost diode for NexGen’s 200V to 800V 100W boost converter.