<u>onsemi.</u>

<u>Si/SiC Hybrid Module</u> – EliteSiC, Split T-Type NPC Inverter, Q2 Package

NXH200T120H3Q2F2SG, NXH200T120H3Q2F2STG

The NXH200T120H3Q2F2SG is a power module containing a split T-type neutral point clamped three-level inverter. The integrated field stop trench IGBTs and SiC Diodes provide lower conduction losses and switching losses, enabling designers to achieve high efficiency and superior reliability. NXH200T120H3Q2F2STG is Pre-applied Thermal Interface Material (TIM) module.

Features

- Split T-type Neutral Point Clamped Three-level Inverter Module
- 1200 V Ultra Field Stop IGBTs & 650 V FS4 IGBTs
- 650 V SiC Diodes
- Low Inductive Layout
- Solderable Pins
- Thermistor
- Pre-applied Thermal Interface Material (TIM)

Typical Applications

- Solar Inverters
- Uninterruptible Power Supplies



Figure 1. NXH200T120H3Q2F2SG Schematic Diagram



PIM56, 93x47 (SOLDER PIN) CASE 180AK

MARKING DIAGRAM



NXH200T120H3Q2F2SG,

NXH200T120H3Q2F2STG= Device Code							
YYWW	= Year and Work Week						
	Code						
А	= Assembly Site Code						
Т	= Test Side Code						
G	= Pb-Free Package						
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PIN CONNECTIONS

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

Table 1. ABSOLUTE MAXIMUM RATINGS (Note 1) T_J = 25 $^\circ$

Table 1	ABSOLUTE	MAXIMUM	RATINGS	(Note 1) T _J	= 25°C unless	otherwise noted
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Rating	Symbol	Value	Unit

Table 3. ELECTRICAL CHARACTERISTICS $T_J = 25^{\circ}C$ unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
HALF BRIDGE IGBT CHARACTERIST	ICS					
Turn-on Delay Time	$T_J = 125^{\circ}C$	td(on)	-	276	-	ns
Rise Time	$V_{CE} = 350 \text{ V}, I_C = 170 \text{ A } V_{GE} = -5/+15 \text{ V},$ $R_G = 10 \Omega$	t _r	_	97	-	
Turn–off Delay Time		td(off)	-	997	-	
Fall Time]	t _f	-	99	Ι	
Turn-on Switching Loss per Pulse		Eon	-	5.4	-	mJ
Turn–off Switching Loss per Pulse		Eoff	-	7.9	-	
Input Capacitance	$V_{CE} = 25 V. V_{GE} = 0 V$	Cies	_	35615	-	pF
Output Capacitance		Coes	_	700	-	
Reverse Transfer Capacitance		Cres	-	530	-	
Total Gate Charge	V_{CE} = 600 V, I _C = 200 A, V _{GE} = 15 V	Qg	-	1706.4	-	nC
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness < 100 $\mu m,$ λ = 2.87 W/mK	RthJH	-	0.24	-	°C/W
Thermal Resistance – chip-to-case		RthJC	_	0.13	-	°C/W
NEUTRAL POINT FREEWHEEL DIODE	E CHARACTERISTICS					
Diode Reverse Leakage Current	V _R = 650 V	I _R	-	-	100	μΑ
Diode Forward Voltage	I _F = 100 A, T _J = 25°C	V _F	1.2	1.48	2.7	V
	I _F = 100 A, T _J = 175°C		-	1.90	-	
Reverse Recovery Time	$T_J = 25^{\circ}C$	trr	-	26.6	-	ns
Reverse Recovery Charge	$V_{CE} = 350 \text{ V}, \text{ I}_{C} = 170 \text{ A } \text{V}_{GE} = -5/+15 \text{ V},$ $R_{G} = 10 \Omega$	Qrr	_	308	-	nC
Peak Reverse Recovery Current		IRRM	-	16.8	-	А
Peak Rate of Fall of Recovery Current	1	di/dt	-	1659	-	A/μs
Reverse Recovery Energy	1	Err	-	34.5	-	μJ
Reverse Recovery Time	T _J = 125°C	trr	-	25.8	-	ns
Reverse Recovery Charge	$V_{CE} = 350 \text{ V}, I_C = 170 \text{ A}$ $V_{CE} = -5/+15 \text{ V}, R_C = 10 \Omega$	Qrr	-	294	-	nC
Peak Reverse Recovery Current		IRRM	-	18.0	-	А
Peak Rate of Fall of Recovery Current		di/dt	_	1672	_	A/μs
Reverse Recovery Energy	1	Err	_	35.2	_	μJ
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness < 100 μm,	RthJH	_	0.54	-	°C/W
Thermal Resistance – chip-to-case	λ = 2.87 W/mK	RthJC	_	0.43	_	°C/W
NEUTRAL POINT IGBT CHARACTERI	STICS					

Collector–Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 650 V	ICES	-	-	300	μΑ
Collector–Emitter Saturation Voltage	$V_{GE} = 15 \text{ V}, \text{ I}_{C} = 150 \text{ A}, \text{ T}_{J} = 25^{\circ}\text{C}$	VCE(sat)	0.8	1.36	2.05	V
	V _{GE} = 15 V, I _C = 150 A, T _J = 175°C					

Table 3. ELECTRICAL CHARACTERISTICS $T_J = 25^{\circ}C$ unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit	
NEUTRAL POINT IGBT CHARACTERISTICS							
Turn–on Delay Time	$T_J = 25^{\circ}C$	td(on)	-	94	-	ns	
Rise Time	$V_{CE} = 350 \text{ V}, \text{ I}_{C} = 170 \text{ A } \text{V}_{GE} = -5/+15 \text{ V},$ $R_{G} = 10 \Omega$	t _r	-	45	-		
Turn–off Delay Time		td(off)	-	224	-		
Fall Time]	t _f	-	22	—		
Turn-on Switching Loss per Pulse		Eon	-	3.1	-	mJ	
Turn off Switching Loss per Pulse		Eoff	-	2.4	-		
Turn–on Delay Time	T _J = 125°C	td(on)	-	92	_	ns	
Rise Time	V_{CE} = 350 V, I_{C} = 170 A V_{GE} = –5/+15 V, R_{G} = 10 Ω	t _r	-	51	-		
Turn–off Delay Time		td(off)	-	244	-		
Fall Time]	t _f	-	19	—		
Turn-on Switching Loss per Pulse		Eon	-	4.7	-	mJ	
Turn off Switching Loss per Pulse		Eoff	-	3.0	-		
Input Capacitance	V _{CE} = 25 V, V _{GE} = 0 V, f = 100 kHz	Cies	-	9316	_	pF	
Output Capacitance		Coes	_	249	_		
Reverse Transfer Capacitance		Cres	_	34	_		
Total Gate Charge	V_{CE} = 480 V, I _C = 80 A, V _{GE} = 15 V	Qg	-	300.9	-	nC	
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness < 100 μ m,	RthJH	-	0.50	_	°C/W	
Thermal Resistance – chip-to-case	h = 2.87 VV/IIIK	RthJC	_	0.36	_	°C/W	
HALF BRIDGE FREEWHEEL DIODE C	HARACTERISTICS			-	-	-	

Diode Reverse Leakage Current	V _R = 1200 V	I _R	-	-	100	μΑ
	I _F =150 A, T _J = 25°C	V _F	1.6	2.71	3.6	V
	I _F = 150 A, T _J = 175°C		-	2.00	-	
	\frown	l l				

T _J = 25°C	
V _{CE} = 350 V, I _C = 170	A $V_{GE} = -5005$ V,
D 10.0	



Table 3. ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Тур	Max	Unit
HALF BRIDGE INVERSE DIODE CHARACTERISTICS						
Diode Forward Voltage	$I_{F} = 7 \text{ A}, T_{J} = 25^{\circ}\text{C}$	V _F	1.05	1.93	2.80	V
	I _F = 7 A, T _J = 175°C		_	1.29	-	
Thermal Resistance – chip-to-heatsink	Thermal grease, Thickness < 100 $\mu\text{m},$ λ = 2.87 W/mK	R _{thJH}	-	1.71	-	°C/W

TYPICAL CHARACTERISTICS -

TYPICAL CHARACTERISTICS - HALF BRIDGE IGBT AND NEUTRAL POINT DIODE







TYPICAL CHARACTERISTICS - HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE







Figure 41. Typical Turn ON Switching Time vs. $\rm I_{C}$



Figure 43. Typical Turn ON Loss vs. ${\rm R}_{\rm G}$



Figure 40. Typical Turn OFF Loss vs. I_C



Figure 42. Typical Turn OFF Switching Time vs. IC



TYPICAL CHARACTERISTICS -

TYPICAL CHARACTERISTICS - NEUTRAL POINT INVERSE DIODE

Figure 58. Diode Forward Characteristic

Figure 59. Diode Transient Thermal Impedance



PIM56, 93x47 (SOLDER PIN) CASE 180AK ISSUE B

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