HMN20N65D

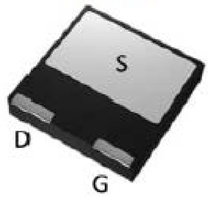
Description

The HMN20N65D GaN FET is a normally-off Cascode device, it be based on a metal insulated high electron mobile transistor（MISHEMT）. It will offer increased noise immunity with a≥1.5V threshold. H&M Semi GaN FET offers improved efficiency over silicon, through lower gate charge, lower crossover loss, and smaller reverse recovery charge.

Features

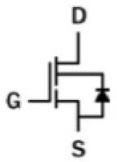
- 100% Dynamic $R_{DS(on)}$ production tested
- Typ. $R_{DS(on)}$ =125mΩ
- Fast switching
- Ultra Low gate charge
- Wide gate safety margin
- Increased noise immunity

DFN8*8

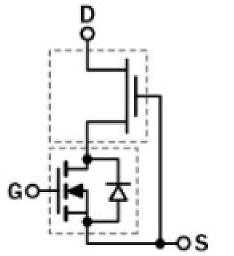


Applications

- Adaptor
- PV inverter
- Industrial SMPS
- Datacenter
- Telecom



Cascode Schematic Symbol



Cascode Device Structure

Key Specifications

Symbol	Value	Unit
$V_{DS.max}$	650	V
$R_{DS(on).typ}$	125	mΩ
I_D	20	A
$Q_{G.typ}$	20	nC
$Q_{rr.typ}$	56	nC

Thermal Resistance

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Junction-to-Case	1.8	℃/W
$R_{\theta JA}$	Junction-to-Ambient	50	℃/W

Electrical Characteristics Tc= 25℃ unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit

Static Characteristics

OFF Characteristics						
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V	650	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=650V, V_{GS}=0V, T_J=25℃	--	7	15	μA
		V_{DS}=650V, V_{GS}=0V, T_J=150℃	--	20		μA
I_{GSS}	Gate to Source Forward Leakage	V_{GS}=+20V	--	--	100	nA
	Gate to Source Reverse Leakage	V_{GS}=-20V	--	--	-100	nA

ON Characteristics						
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V, I_D=8A, T_J=25℃	--	125	--	mΩ
		V_{GS}=10V, I_D=8A, T_J=150℃	--	250	--	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	--	1.65	--	V

Dynamic Characteristics

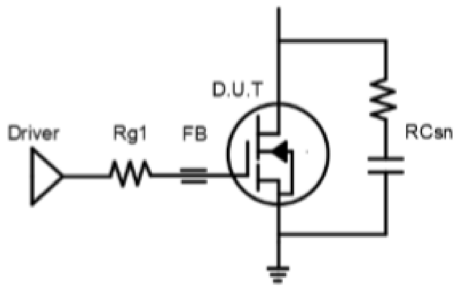
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=650V f=1MHz	--	1050	--	pF
C_{oss}	Output Capacitance		--	56	--	
C_{rss}	Reverse Transfer Capacitance		--	2	--	

Resistive Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	I_D=10A, V_{DS} =400V R_G=10Ω, V_{GS}=0V to 10V	--	30	--	ns
tr	Rise Time		--	12	--	
$t_{d(off)}$	Turn-Off Delay Time		--	60	--	
t_f	Fall Time		--	9	--	
Q_g	Total Gate Charge	V_{GS}=0V to 10V, I_D=10A, V_{DS} =400V	--	20	--	nC
Q_{gs}	Gate to Source Charge		--	4.5	--	
Q_{gd}	Gate to Drain ("Miller") Charge		--	3.5	--	

Reverse D Characteristics

Source-Drain Diode Characteristics						
I_S	Reverse current		--	--	10	A
V_{SD}	Reverse Voltage	I_S=10A, V_{GS}=0V	--	--	2	V
t_{rr}	Reverse Recovery Time	I_S=0A to 9A, d_i/d_t=1125A/us, V_{DD}=400V	--	12	--	ns
Q_{rr}	Reverse Recovery Charge		--	56	--	nC

Circuit Implementation



Recommended Gate Drive Circuit

Recommended gate drive:10V, witch $R_{G(tot)}$=11Ω, where $R_{G(tot)}=R_{g1}+R_{Driver}$

Gate Ferrite Bead（FB）	Gate Resistance1（R_{g1}）	RC Snubber（RCsn）
MMZ1608S301ATA00	10Ω	45pF+15Ω

Notes:

a. RCsn should be placed as close as possible to the drain pin

b. The layout and wiring of drive circuit should be as short as possible

Typical Characteristics Curve Tc= 25℃ unless otherwise specified

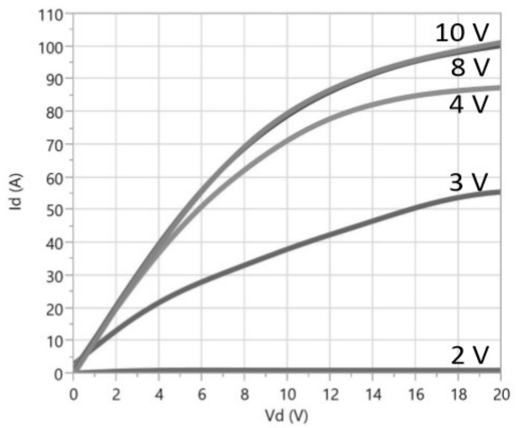


Figure 1.Typical Output Characteristics T_j=25℃

Parameter:V_{GS}

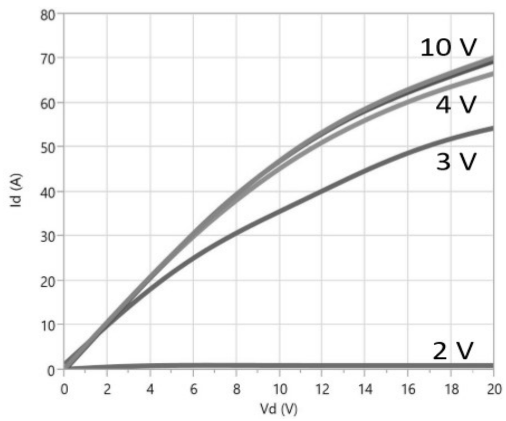


Figure 2.Typical Output Characteristics T_j=150℃

Parameter:V_{GS}

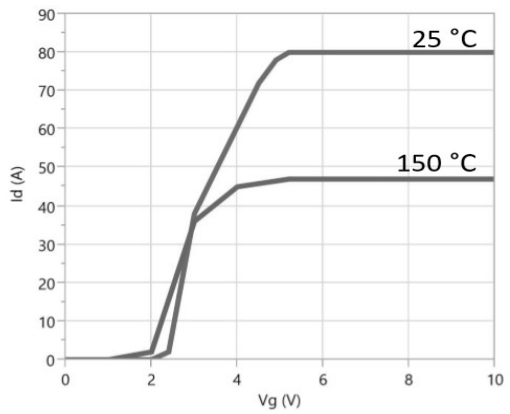


Figure 3. Typical Transfer Characteristics

V_{DS}=10V, Parameter:T_J

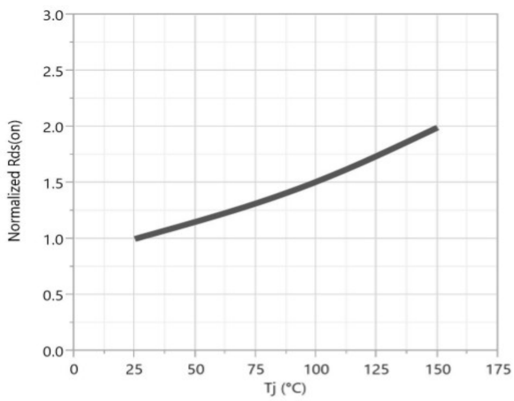


Figure 4. Normalized On-resistance

I_D=8A, V_{GS}=10V

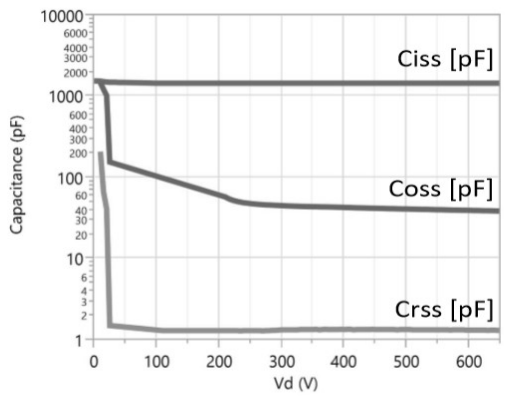


Figure 5. Typical Capacitance

V_{GS}=0V, f=1MHZ

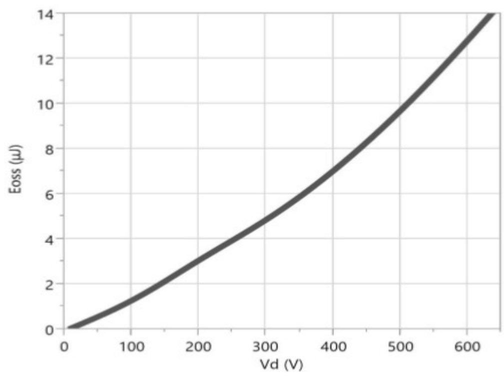


Figure 6. Typical Coss Stored Energy

Typical Characteristics Curve Tc= 25℃ unless otherwise specified

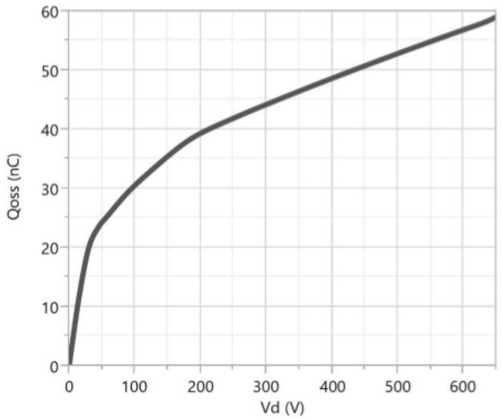


Figure 7. Typical Qoss

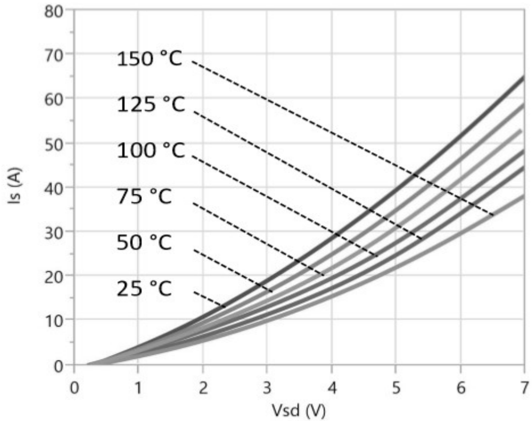


Figure 8. Forward Characteristic of Rev. Diode

$I_S = f(V_S)$, Parameter: T_J

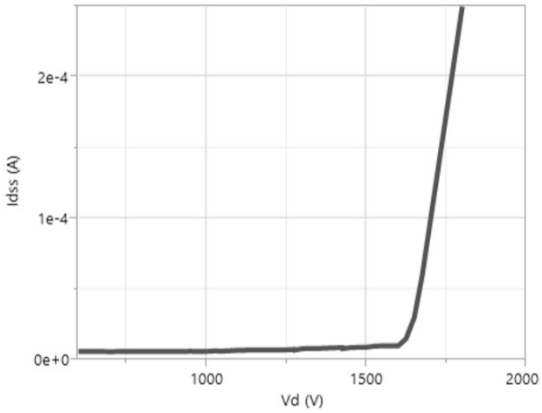


Figure 9. Drain-Source Breakdown Voltage

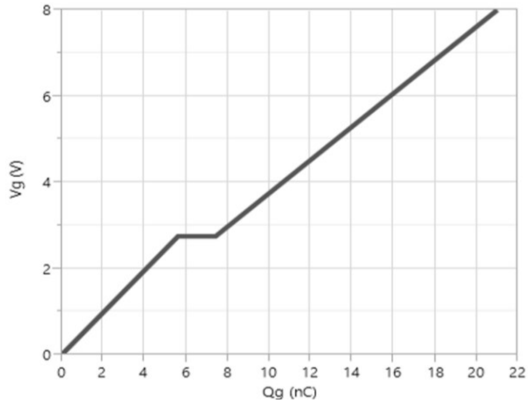


Figure 10. Typical Gate Charge

$I_{DS} = 10A$, $V_{DS} = 400V$

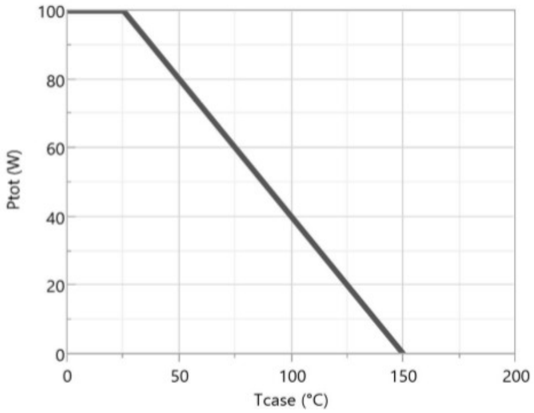


Figure 11. Power Dissipation

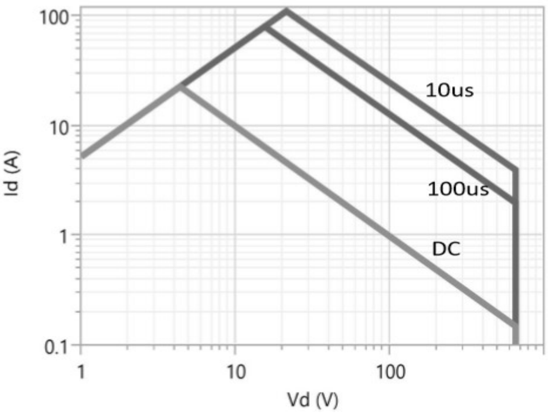


Figure 12. Safe Operating Area T_c=25℃

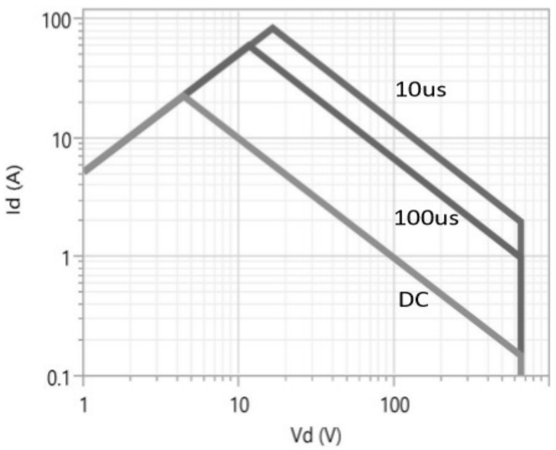


Figure 13. Safe Operating Area T_c=80℃

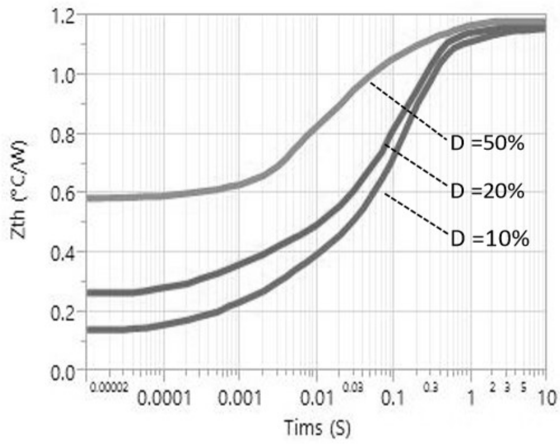


Figure 14. Transient Thermal Resistance

Test Circuits and Waveforms

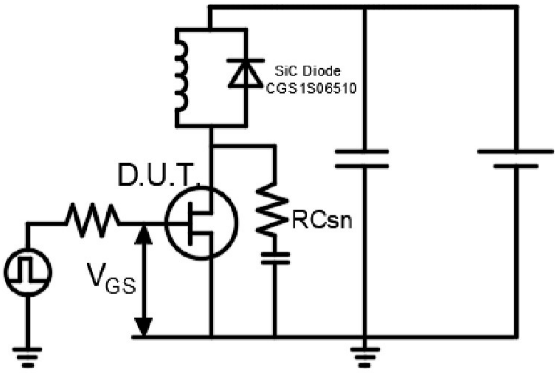


Figure 15. Switching Time Test Circuit

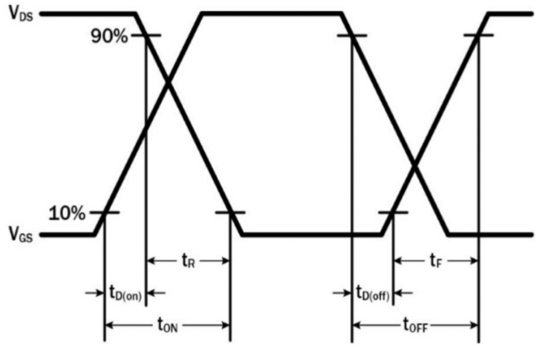


Figure 16. Switching Time Waveform

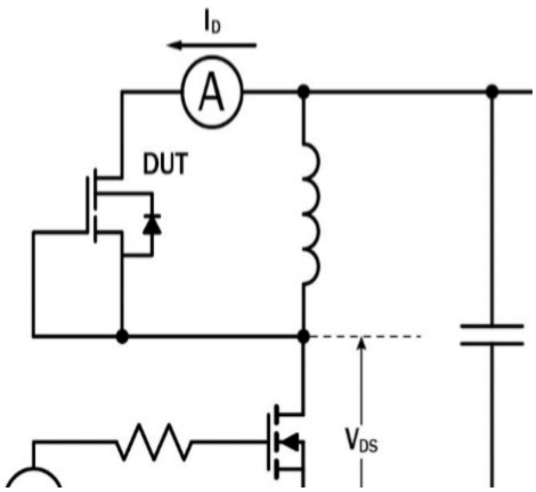


Figure 17. Diode Characteristics Test Circuit

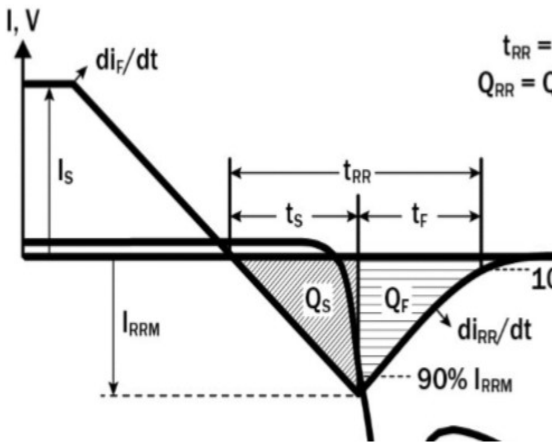


Figure 18. Diode Recovery Waveform

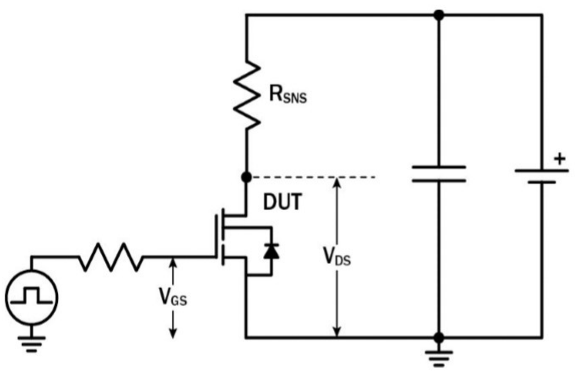
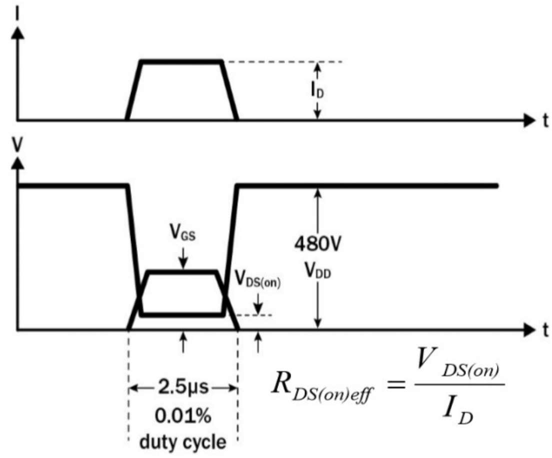


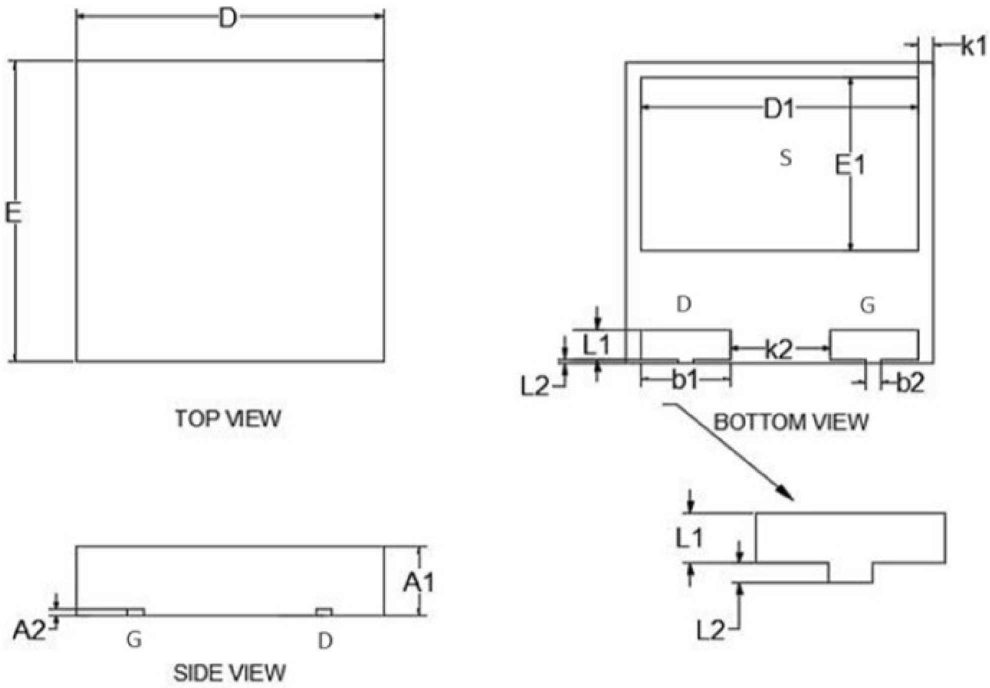
Figure 19. Dynamic $R_{DS(on)eff}$ Test Circuit



$$R_{DS(on)eff} = \frac{V_{DS(on)}}{I_D}$$

Figure 20. Dynamic $R_{DS(on)eff}$ Waveform

Mechanical Dimensions



DFN 8*8mm Package

Items	Values(mm)	
	MIN	MAX
A1	1.825	1.875
A2	0.195	0.211
D	7.950	8.050
E	7.950	8.050
D1	7.150	7.250
E1	4.550	4.650
K1	0.375	0.425
K2	2.575	2.625
b1	2.275	2.325
b2	0.375	0.425
L1	0.775	0.825
L2	0.075	0.125

The name and content of poisonous and harmful material in products

Part's Name	Hazardous Substance									
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE	DIBP	DEHP	DBP	BBP
Limit	≤ 0.1%	≤ 0.1%	≤ 0.01%	≤ 0.1%	≤ 0.1%	≤ 0.1%	≤ 0.1%	≤ 0.1%	≤ 0.1%	≤ 0.1%
Lead Frame	○	○	○	○	○	○	○	○	○	○
Molding	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
Wire Bonding	○	○	○	○	○	○	○	○	○	○
Solder	×	○	○	○	○	○	○	○	○	○
Note	○: Means the hazardous material is under the criterion of 2011/65/EU. ×: Means the hazardous material exceeds the criterion of 2011/65/EU. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.									

Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.

2. When installing the heatsink, please pay attention to the torsional moment and the smoothness of the heatsink.

3. GaN FET is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.

4. This publication is made by H&M Semi and subject to regular change without notice.