

NSH045N100T



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Voltage: 100 Volts

Current: 180 Ampers

Package: TOLL

Features

- NH'S Advanced SGT Technology
- Low Reverse Transfer Capacitances
- Low Gate Charge For Low Switching Loss
- Excellent $Q_g \cdot R_{ds(on)}$ Product(FOM)

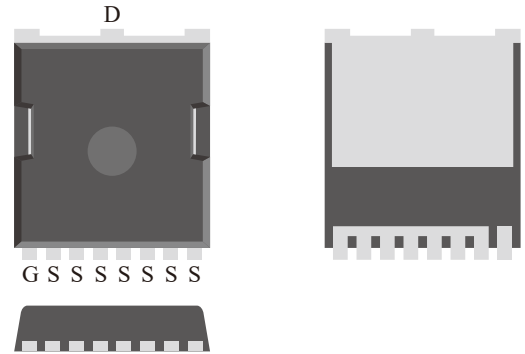
Typical Applications

- Synchronous Rectification
- High-Frequency Circuits
- The Motor Drives
- Automotive Electronics

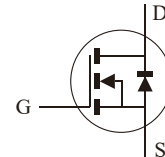
Product Summary

VDS Min.@T _j	100	V
I _D Min.@Ta	179.9	A
RDS(ON)(TYP)@10V	3.7	mΩ

Diagram:



Polarity:



***100% UIS TESTED**

***100% DVSD TESTED**

Absolute Maximum Ratings (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	100	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 ℃	I _D	179.9	A
	Ta= 100 ℃		115.2	
Drain Current-Pulse (Note 1)	T _j < 150 ℃	I _{DM}	599	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	Ta= 25 ℃	P _D	417	W
	Ta= 100 ℃		167	
Derating Factor		D _F	3.33	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	53.0	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH IAS= 53.0 A, RG= 10.0 Ω Starting T _j =25 ℃, VG= 10.0 V	E _{AS}	702	mJ

Thermal Characteristics (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 150	℃
Storage Temperature Range		T _{STD}	-55 to 150	℃
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25℃	R _{θJA}	45.0	℃/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	0.30	

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig. 13).

NSH045N100T
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Electrical Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Static Off Characteristics						
Drain-Source Breakdown Voltage	VGS=0V,ID=250uA	BV _{DSS}	100	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.11	--	V/℃
Drain-Source Leakage Current	VDS= 100 V,VGS=0V	I _{DSS}	--	--	1	uA
Gate-Body Leakage Current	VGS= ±20 V,VDS=0V	I _{GSS}	--	--	±100	nA
Forward Transconductance	ID= 20.0 A,VDS= 5 V	g _{fs}	--	45.0	--	S
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	2.0	2.9	4.0	V
Drain-Source On Resistance	ID= 20.0 A,VGS= 10.0 V	R _{DS(ON)}	--	3.7	4.5	mΩ
	ID= 20.0 A,VGS= 4.5 V		--	4.3	6.0	
Dynamic Characteristics						
Input Capacitance	VDS= 50 V	C _{iss}	--	4700.0	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	600.0	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	14.0	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 50 V	t _{d(on)}	--	35.0	--	ns
Turn-On Rise Time	VGS= 10.0 V	t _r	--	18.0	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	45.0	--	ns
Turn-Off Rise Time		t _f	--	55.0	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 50 V	Q _g	--	70.0	--	nC
Gate-Source Charge	VGS= 10.0 V	Q _{gs}	--	28.0	--	nC
Gate-Drain Charge	ID= 20.0 A	Q _{gd}	--	15.0	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _s	--	--	180	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	720	A
Diode Forward Voltage	ID= 20.0 A,VGS=0V	V _{SD}	--	0.80	1.2	V
Reverse Recovery Time	ID= 20.0 A,di/dt= 100 A/us	t _{rr}	--	70.0	--	ns
Reverse Recovery Charge	VGS= 10.0 V,VDD= 50 V	Q _{rr}	--	170.0	--	nC

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Typical Characteristics Curves

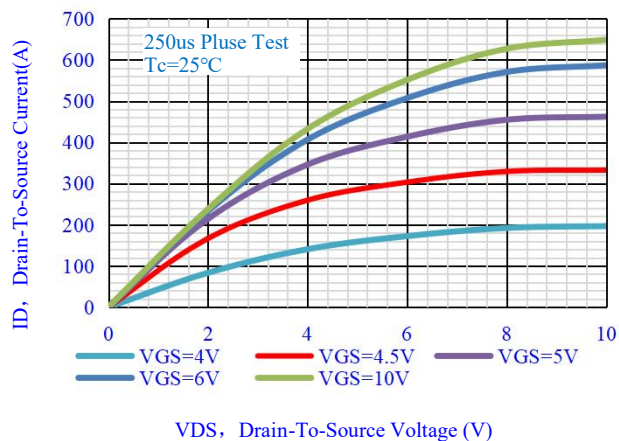


Fig.1-Output Characteristics

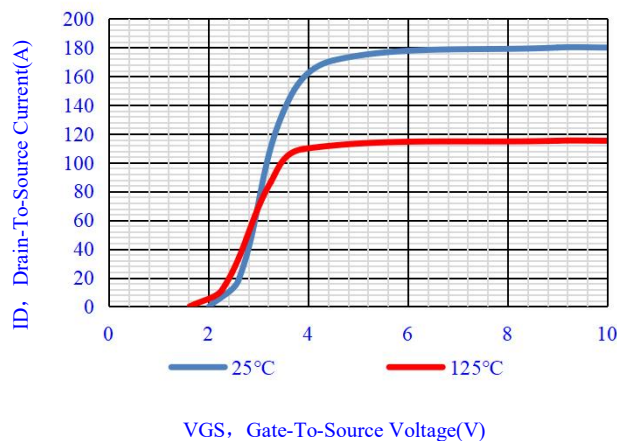


Fig.2- Transfer Characteristics

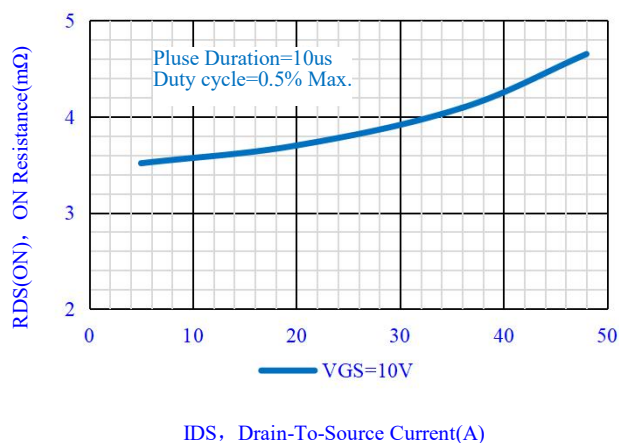


Fig.3- On Resistance vs. Drain Current

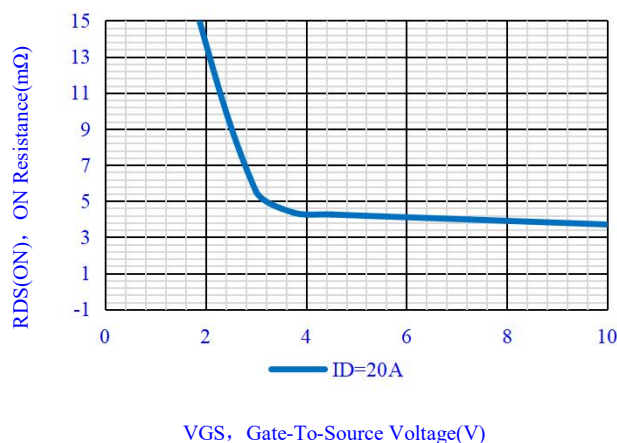


Fig.4- On Resistance vs. Gate Source Voltage

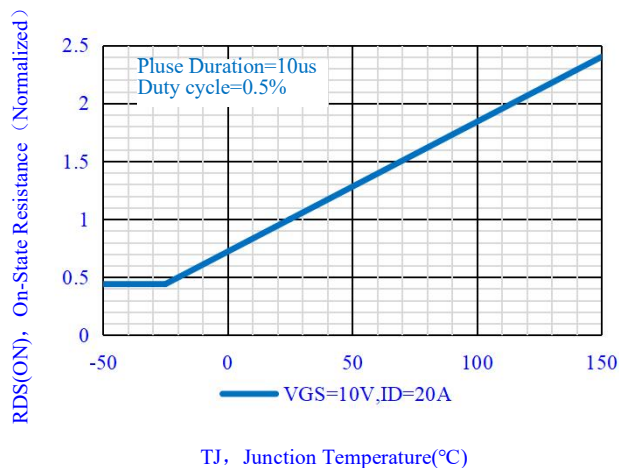


Fig.5- On Resistance vs. Junction Temperature

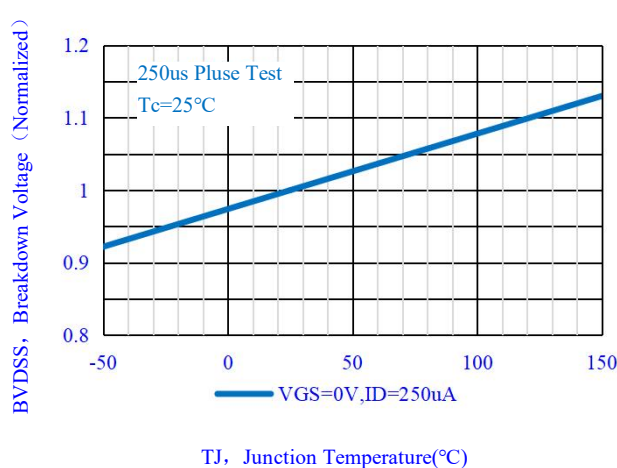


Fig.6- Breakdown Voltage vs. Junction Temperature

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Typical Characteristics Curves

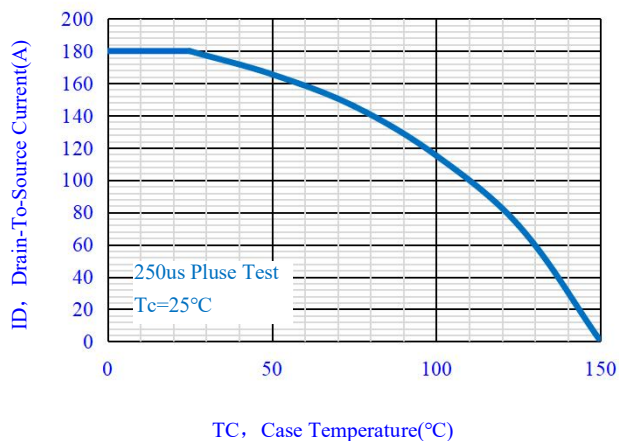


Fig.7-Maximum Continuous Drain Current vs. Case Temperature

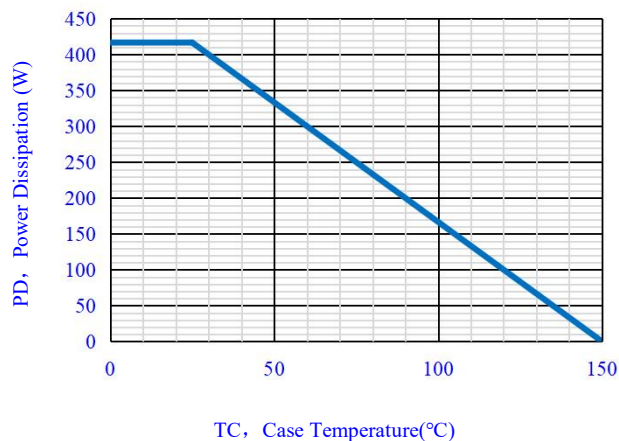


Fig.8-Maximum Power Dissipation vs. Case Temperature

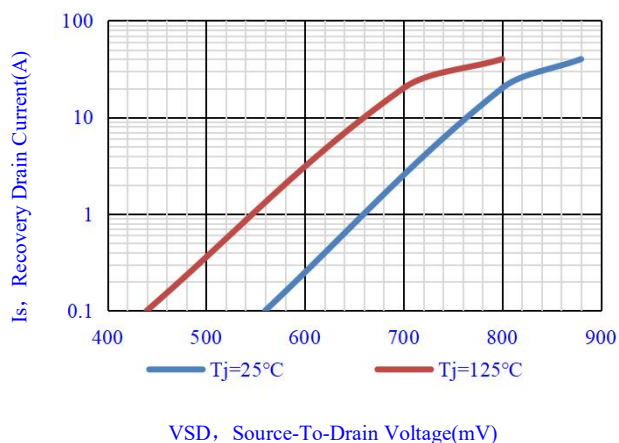


Fig.9- Source-To-Drain Diode Forward Voltage

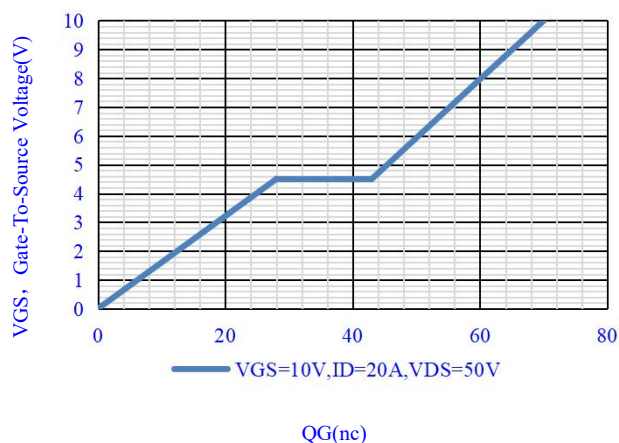


Fig.10-Gate Charge Waveform

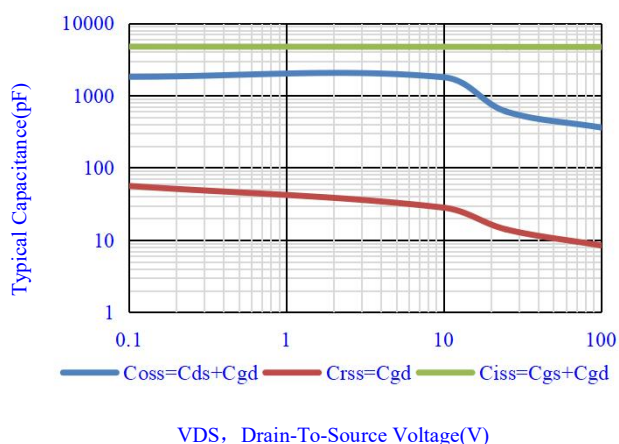


Fig.11-Typical Capacitance vs. Drain-To-Source Voltage

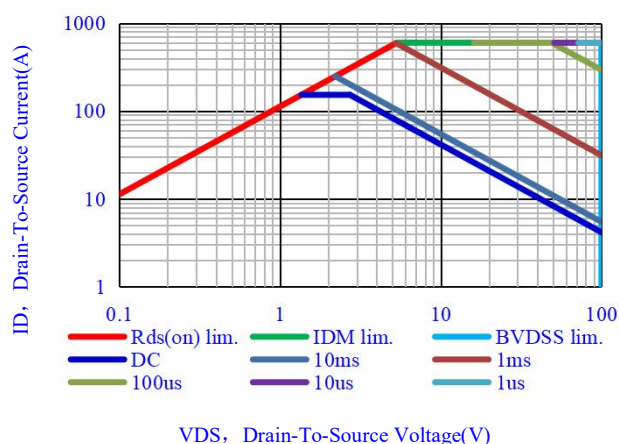


Fig.12-Maximum Safe Operating Area(SOA)

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Typical Characteristics Curves

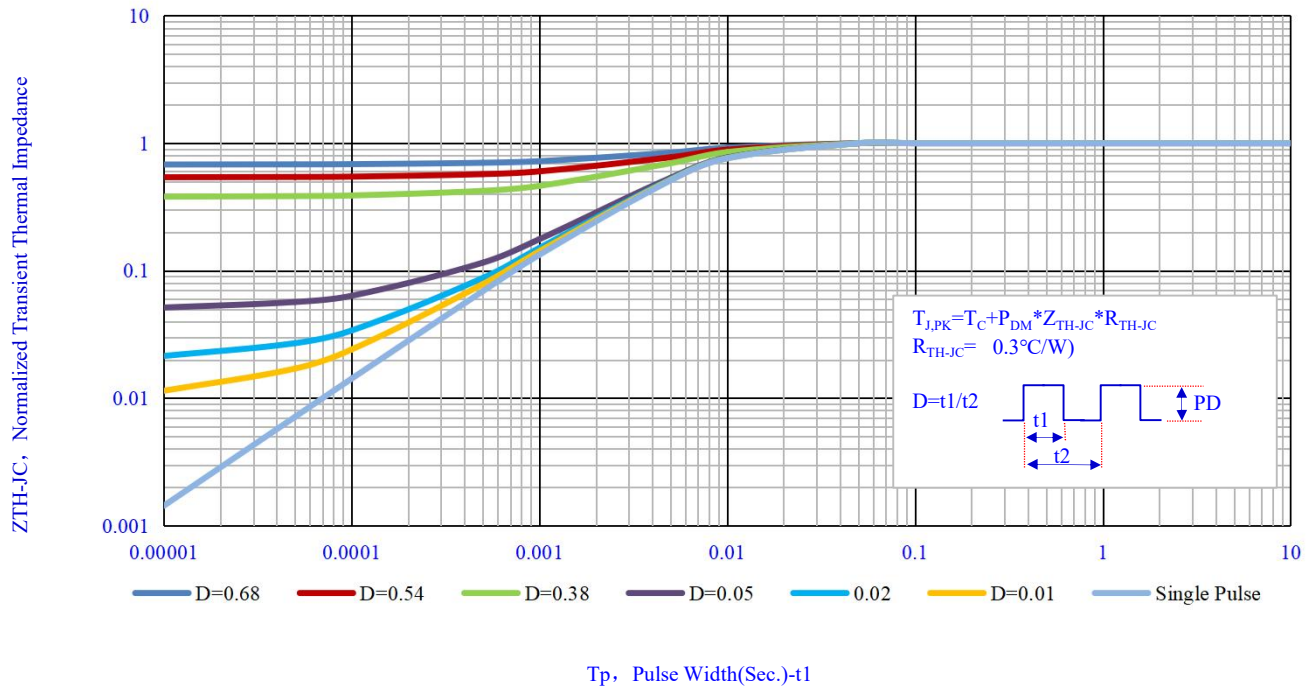


Fig.13- Normalized Maximum Transient Thermal Impedance vs.Pulse Width

Test Circuit & Waveform

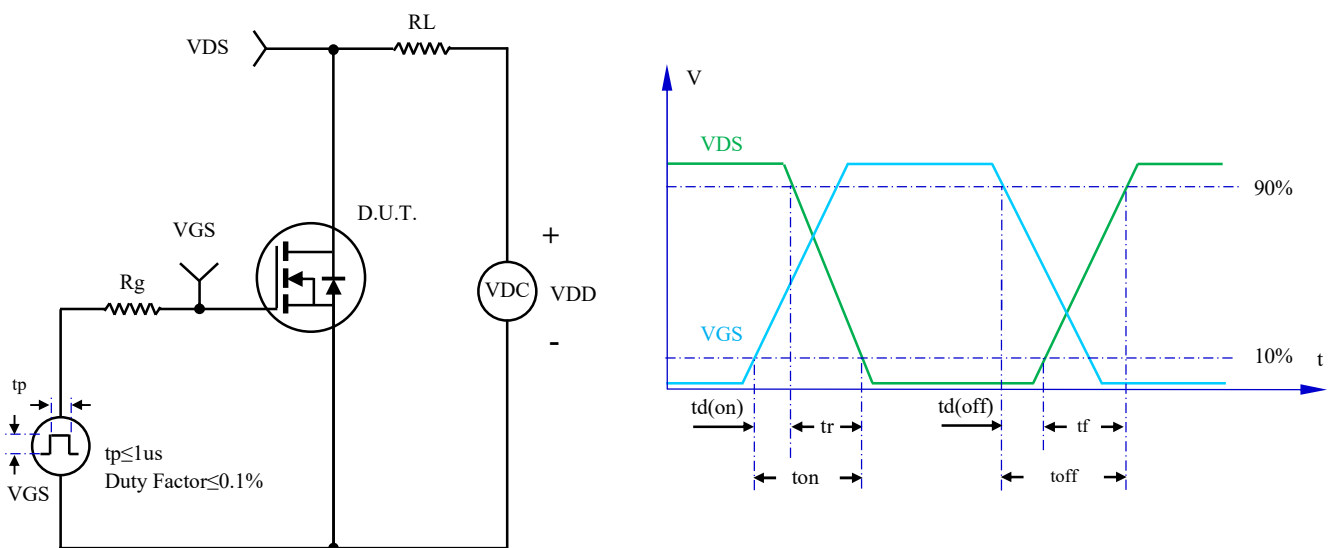


Fig.14- Resistive Switching Test Circuit & Waveform

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Test Circuit & Waveform

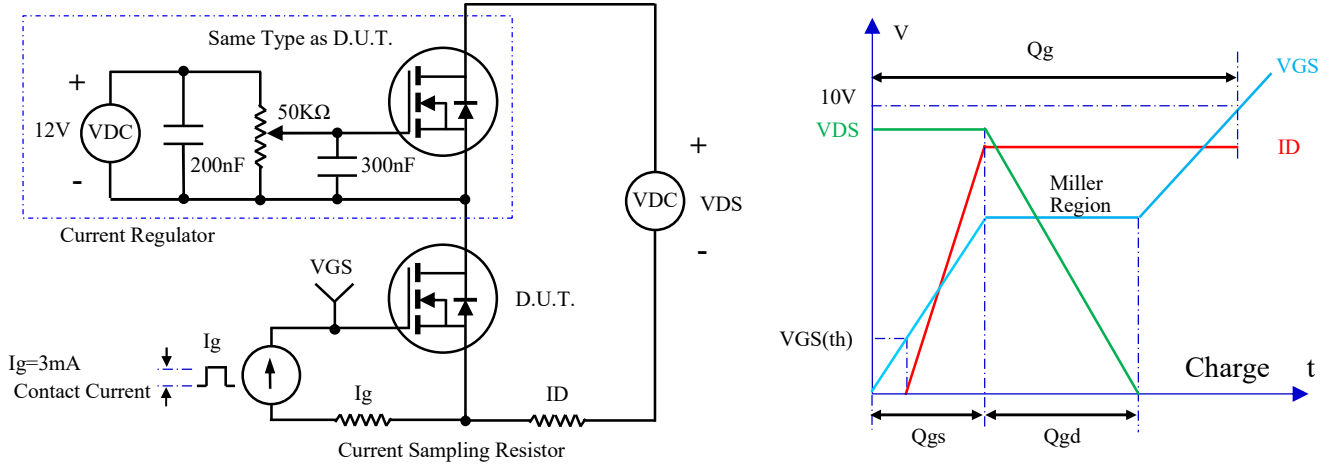


Fig.15- Gate Charge Test Circuit & Waveform

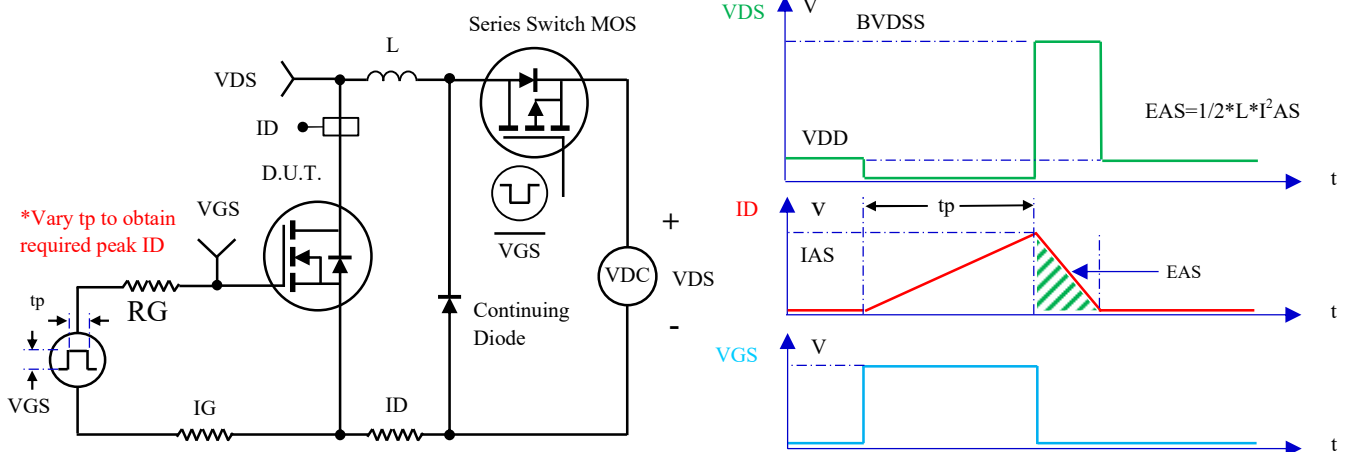


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

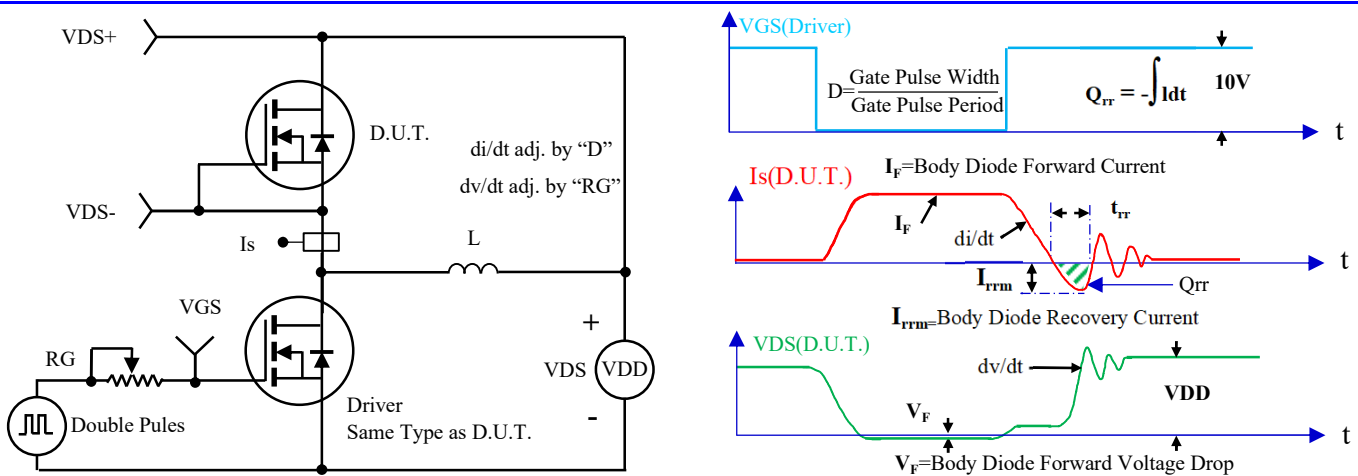


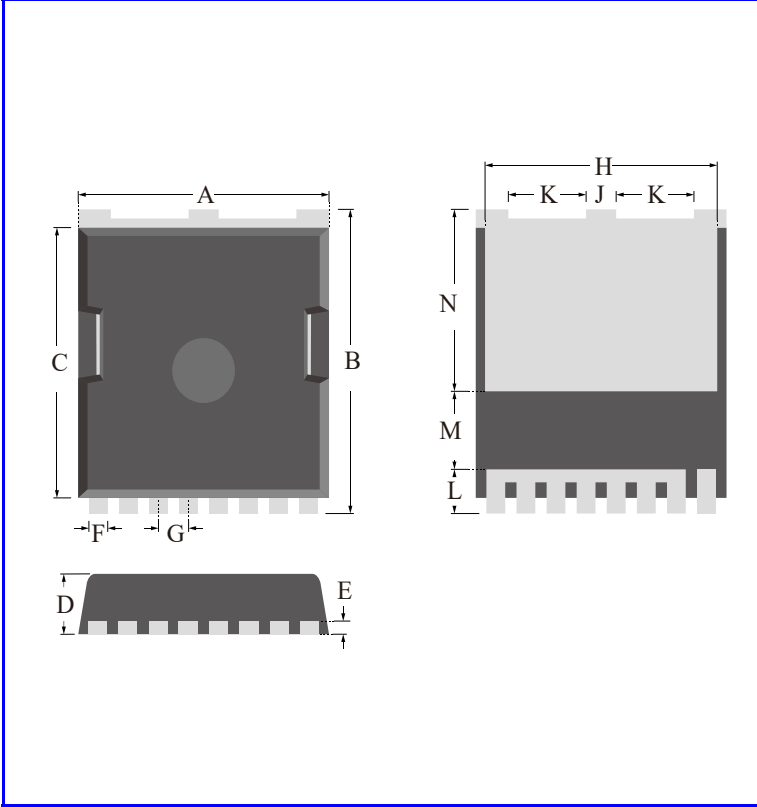
Fig.17- Diode Recovery Test Circuit & Waveform

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



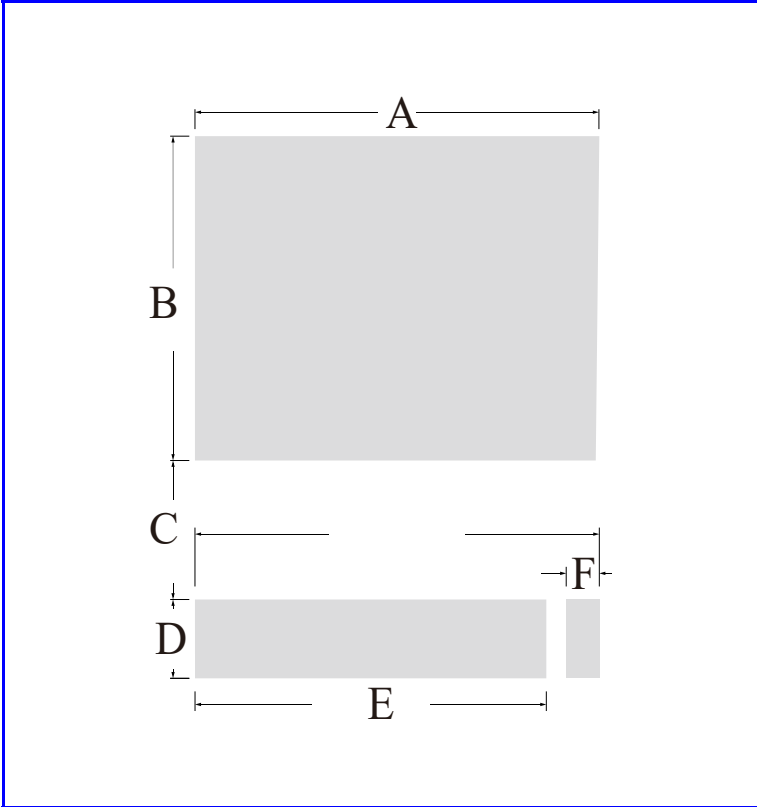
OUTLINE DRAWINGS



TOLL

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.65	-	10.15	0.3799	-	0.3996
B	11.45	-	11.95	0.4508	-	0.4705
C	10.15	-	10.65	0.3996	-	0.4193
D	2.20	-	2.40	0.0866	-	0.0945
E	0.35	-	0.65	0.0138	-	0.0256
F	0.65	-	0.85	0.0256	-	0.0335
G	1.05	-	1.35	0.0413	-	0.0531
H	7.95	-	8.45	0.3130	-	0.3327
J	1.10	-	1.30	0.0433	-	0.0512
K	3.00	-	3.20	0.1181	-	0.1260
L	1.55	-	1.85	0.0610	-	0.0728
M	2.85	-	3.15	0.1122	-	0.1240
N	6.85	-	7.15	0.2697	-	0.2815

RECOMMEDND LAYOUT DRAWINGS



TOLL

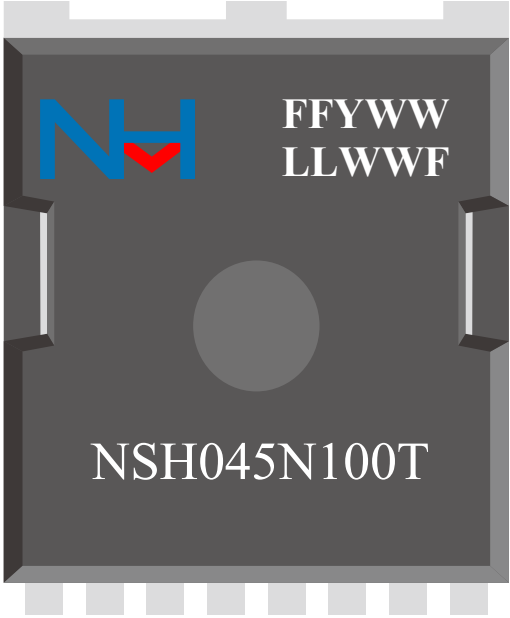
OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	12.00	-	-	0.4724	-
B	-	10.00	-	-	0.3937	-
C	-	5.85	-	-	0.2303	-
D	-	2.50	-	-	0.0984	-
E	-	9.00	-	-	0.3543	-
F	-	1.00	-	-	0.0394	-

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhan Trademark
FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWF=Inernal Code,According To Actual Changes
NSH045N100T=Model

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
TOLL	P1	0.742	13"Reel	2000	4000	24000
TOLL	P2	0.742	13"Reel	1800	1800	9000

NSH045N100T

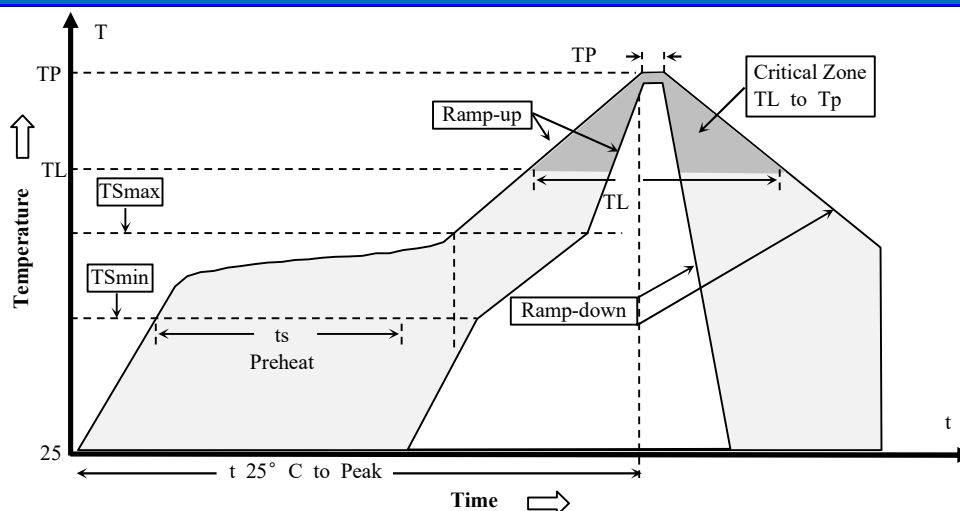
N-Channel Enhanced Shielded Gate Trench Power MOSFET



Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

NSH045N100T

N-Channel Enhanced Shielded Gate Trench Power MOSFET



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