

NSS950N20S



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Voltage:	200 Volts	Current:	18 Ampers	Package:	TO-252
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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)

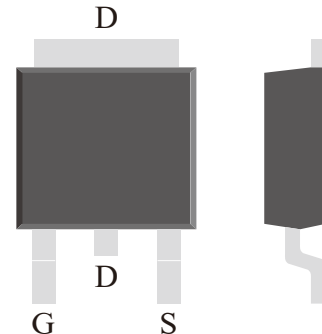
Typical Applications

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

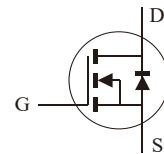
Product Summary

VDS Min.@Tj	200	V
ID Min.@Ta	18	A
RDS(ON)(TYP)@10V	95	mΩ

Diagram:



Polarity:



***100% UIS TESTED**

***100% ΔVDS TESTED**

Absolute Maximum Ratings (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	200	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 °C	I _D	18	A
	Ta= 100 °C		14	
Drain Current-Pulse (Note 1)	Tj< 175 °C	I _{DM}	72	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25°C	Ta= 25 °C	P _D	83	W
	Ta= 100 °C		42	
Derating Factor		D _F	0.56	W/°C
Avalanche Current, Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	4.5	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH IAS= 4.5 A, RG= 10.0 Ω Starting Tj=25 °C, VG = 10.0 V	E _{AS}	5	mJ

Thermal Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 175	°C
Storage Temperature Range		T _{STD}	-55 to 175	°C
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With Ta=25°C	R _{θJA}	50	°C/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	1.8	

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

NSS950N20S

N-Channel Enhanced Shielded Gate Trench Power MOSFET
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}	200	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.19	--	V/℃
Drain-Source Leakage Current	VDS= 200 V,VGS=0V	I _{DSS}	--	--	1	uA
Gate-Body Leakage Current	VGS= ±20 V,VDS=0V	I _{GSS}	--	--	±100	nA
Forward Transconductance	ID= 9.0 A,VDS= 5 V	g _{fs}	--	15	--	S
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	1	2.1	3	V
Drain-Source On Resistance	ID= 9.0 A,VGS= 10.0 V	R _{DS(ON)}	--	95	120	mΩ
	ID= 9.0 A,VGS= 4.5 V		--	106	140	
Dynamic Characteristics						
Input Capacitance	VDS= 50 V	C _{iss}	--	490	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	20	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	6	--	pF
Gate Resistance	VGS=0V,VDS=0V, Freq.=1MHz	R _g	--	5.5	--	Ω
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 100 V	t _{d(on)}	--	9	--	ns
Turn-On Rise Time	VGS= 10.0 V	t _r	--	5	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	13	--	ns
Turn-Off Rise Time		t _f	--	4	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 100 V	Q _g	--	9.8	--	nC
Gate-Source Charge	VGS= 10.0 V	Q _{gs}	--	1.5	--	nC
Gate-Drain Charge	ID= 9.0 A	Q _{gd}	--	3	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _S	--	--	18	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	72	A
Diode Forward Voltage	ID= 9.0 A,VGS=0V	V _{SD}	--	0.9	1.2	V
Reverse Recovery Time	IS= 9.0 A,di/dt= 100 A/us	t _{rr}	--	60	--	ns
Reverse Recovery Charge	VGS= 0.0 V	Q _{rr}	--	126	--	nC
Reverse Recovery Current		I _{RRM}	--	4	--	A

NSS950N20S

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Typical Characteristics Curves

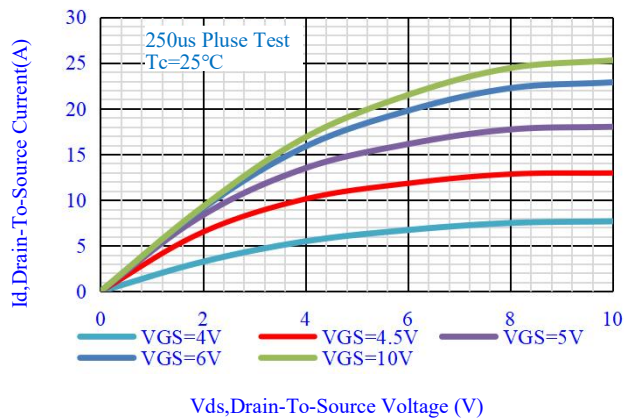


Fig.1-Output Characteristics

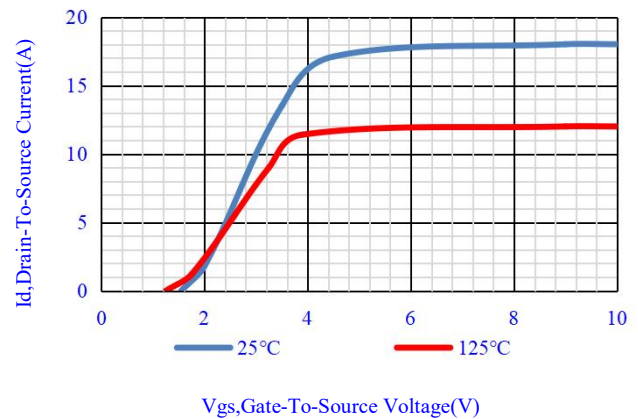


Fig.2-Transfer Characteristics

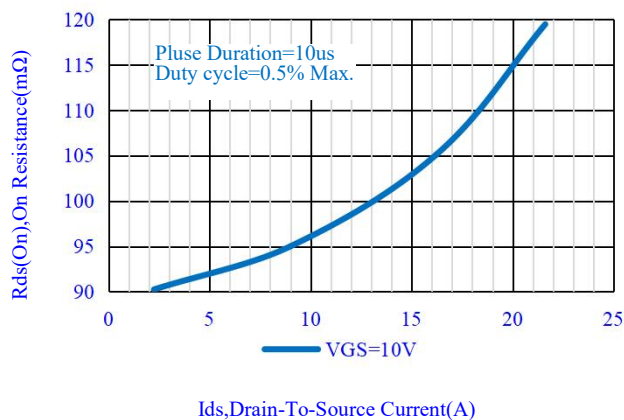


Fig.3-On Resistance Vs. Drain Current

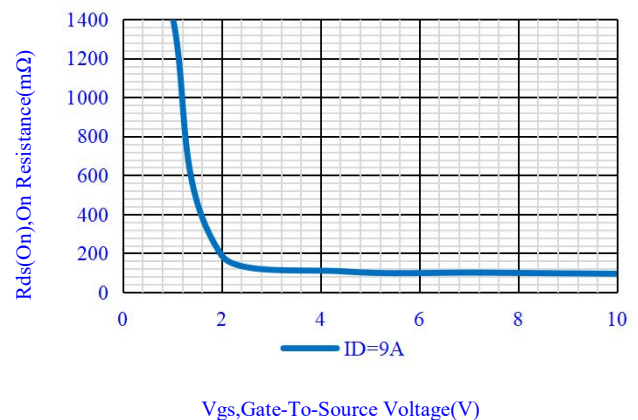


Fig.4-On Resistance Vs. Gate Source Voltage

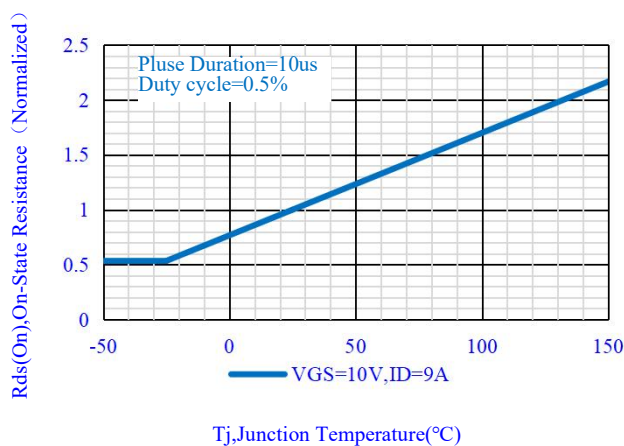


Fig.5-On Resistance Vs. Junction Temperature

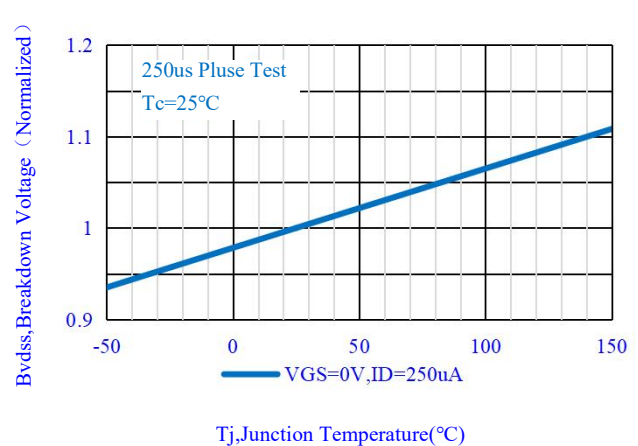


Fig.6-Breakdown Voltage Vs. Junction Temperature

NSS950N20S

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Typical Characteristics Curves

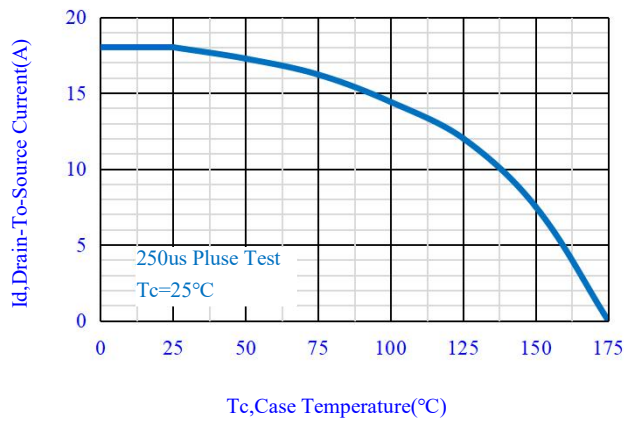


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

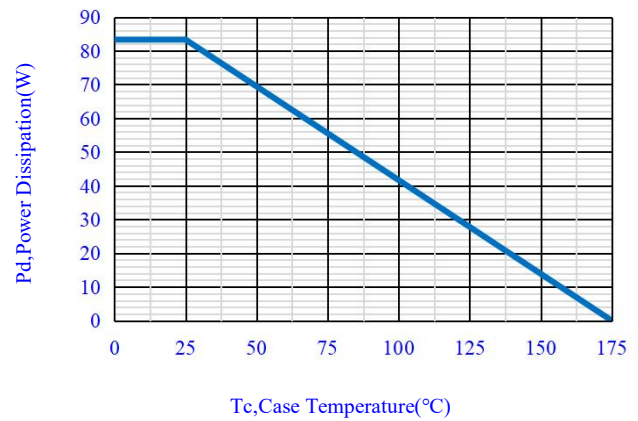


Fig.8-Maximum Power Dissipation Vs. Case Temperature

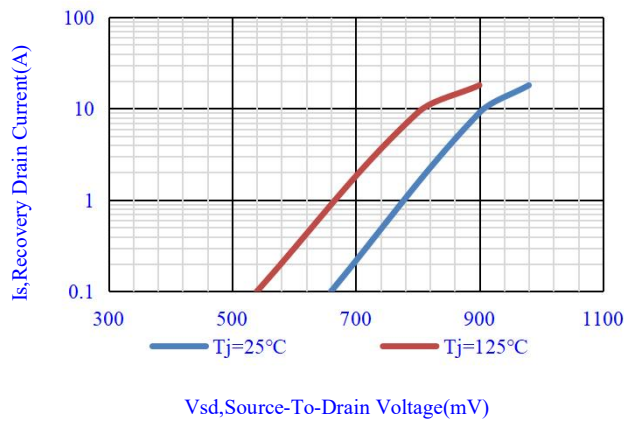


Fig.9-Source-To-Drain Diode Forward Voltage

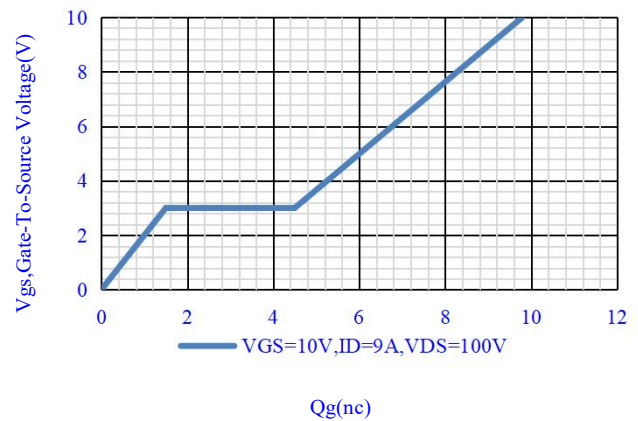


Fig.10-Gate Charge Waveform

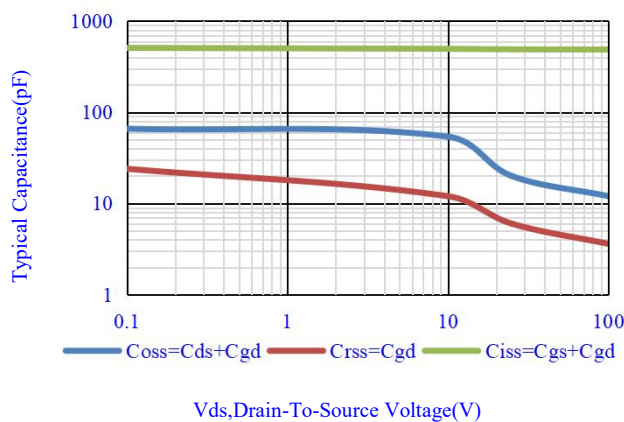


Fig.11-Typical Capacitance Vs. Drain-To-Source Voltage

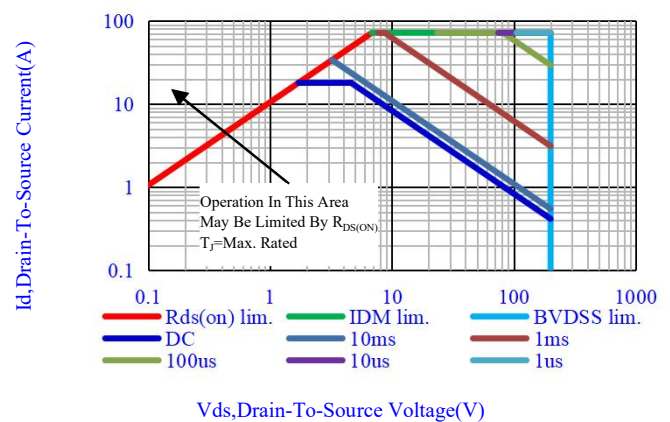


Fig.12-Maximum Safe Operating Area(SOA)

NSS950N20S

N-Channel Enhanced Shielded Gate Trench Power MOSFET



Typical Characteristics Curves

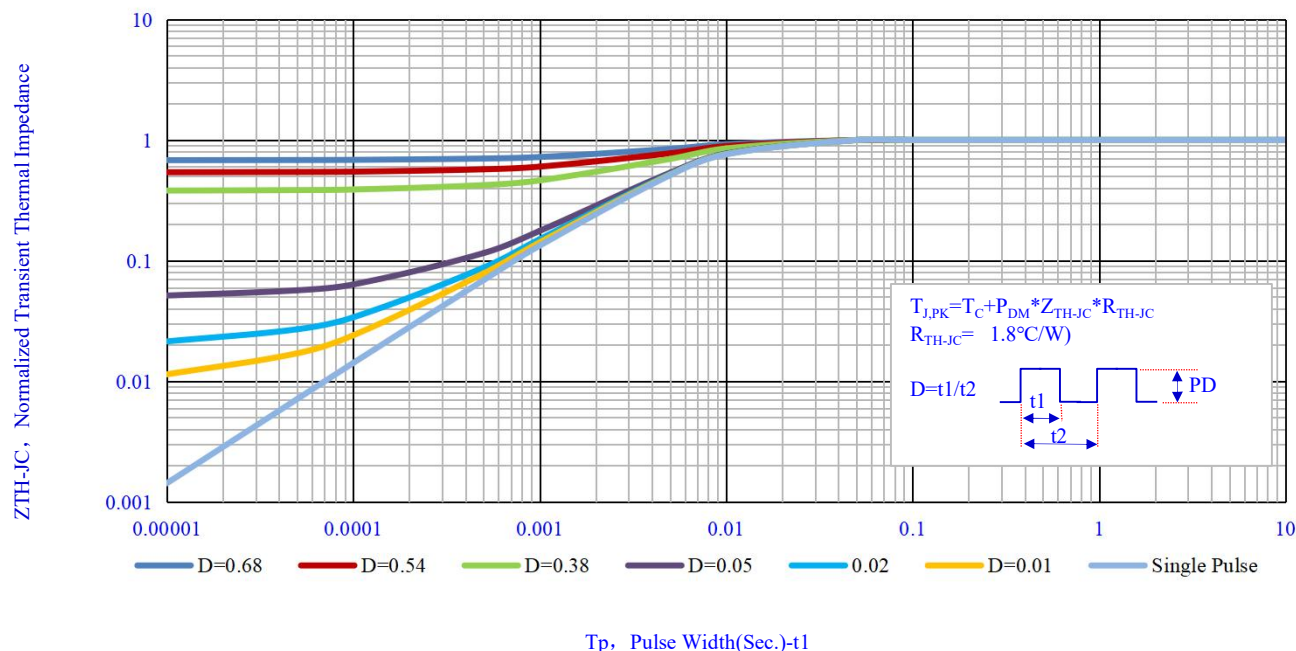


Fig.13- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

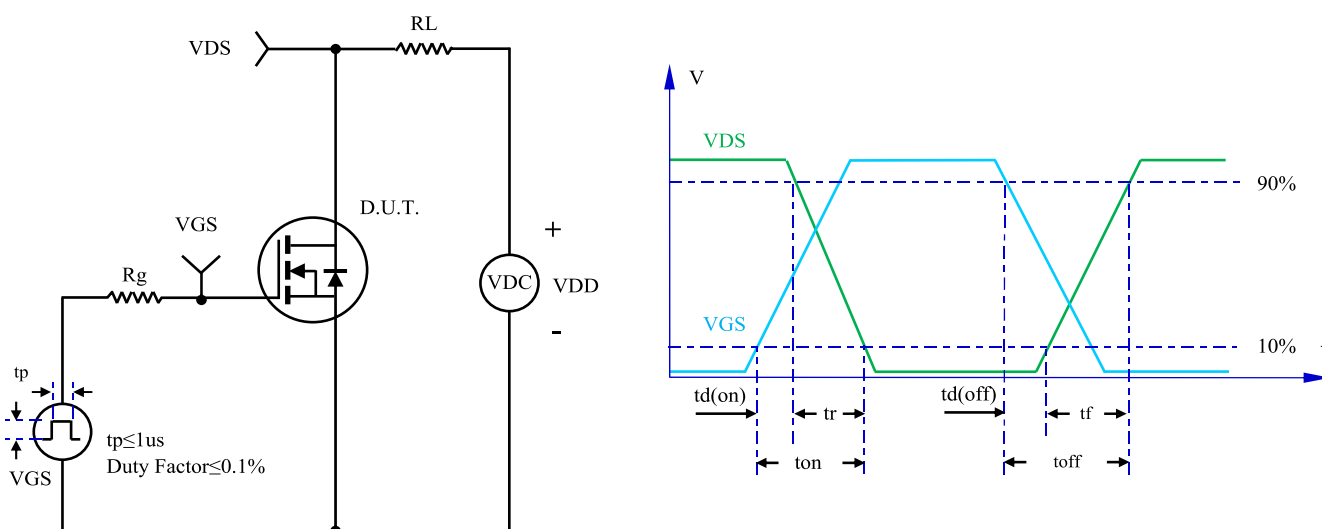


Fig.14- Resistive Switching Test Circuit & Waveform

NSS950N20S



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Test Circuit & Waveform

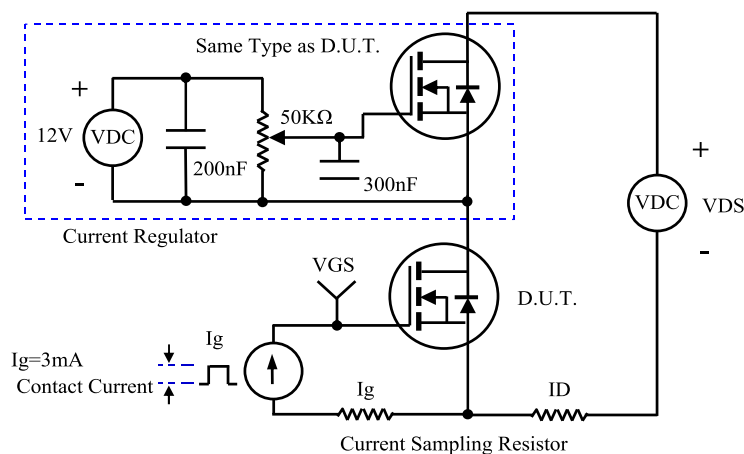


Fig.15- Gate Charge Test Circuit & Waveform

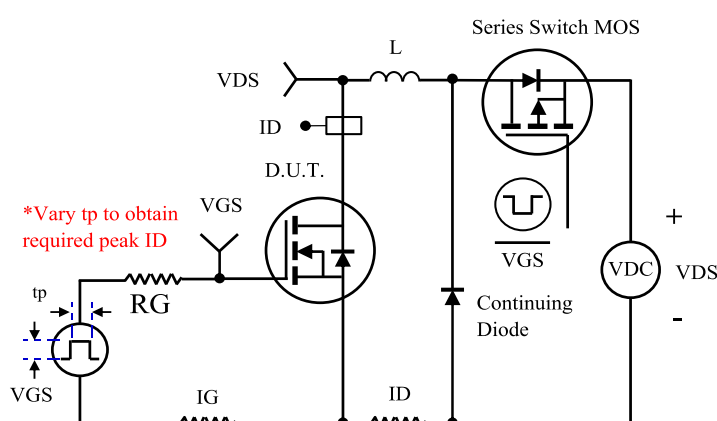


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

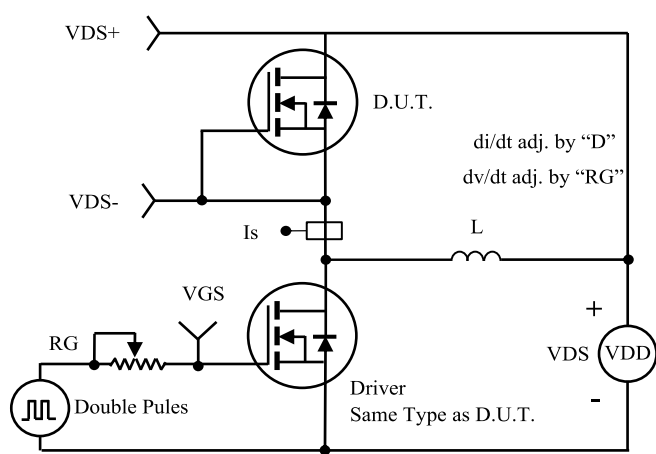


Fig.17- Diode Recovery Test Circuit & Waveform

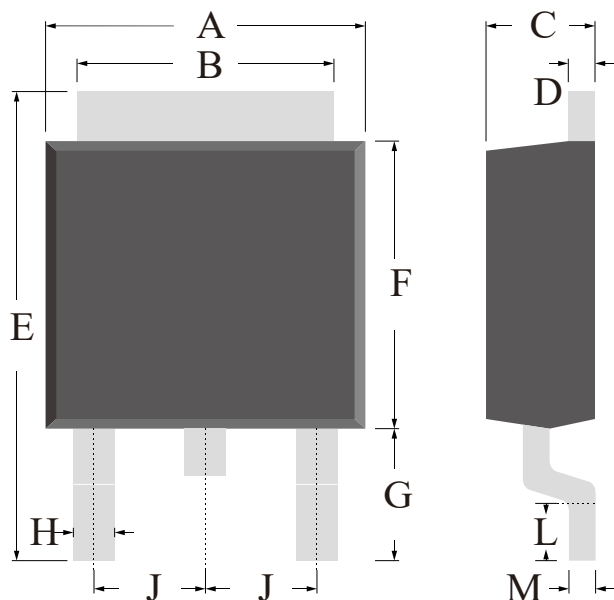
NSS950N20S

N-Channel Enhanced Shielded Gate Trench Power MOSFET



OUTLINE DRAWINGS

TO-252

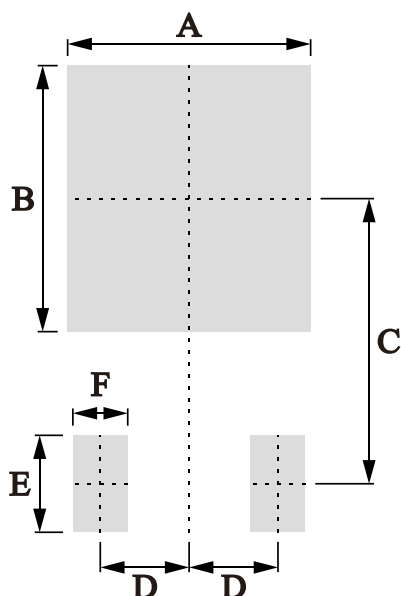


OUTLINE DIMENSIONS

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.10	-	7.10	0.2402	-	0.2795
B	4.80	-	5.80	0.1890	-	0.2283
C	1.95	-	2.55	0.0768	-	0.1004
D	0.35	-	0.75	0.0138	-	0.0295
E	9.25	-	10.75	0.3642	-	0.4232
F	5.60	-	6.60	0.2205	-	0.2598
G	2.50	-	3.10	0.0984	-	0.1220
H	0.65	-	1.05	0.0256	-	0.0413
J	2.10	-	2.50	0.0827	-	0.0984
L	1.00	-	1.40	0.0394	-	0.0551
M	0.35	-	0.75	0.0138	-	0.0295

RECOMMENDED LAYOUT DRAWINGS

TO-252



OUTLINE DIMENSIONS

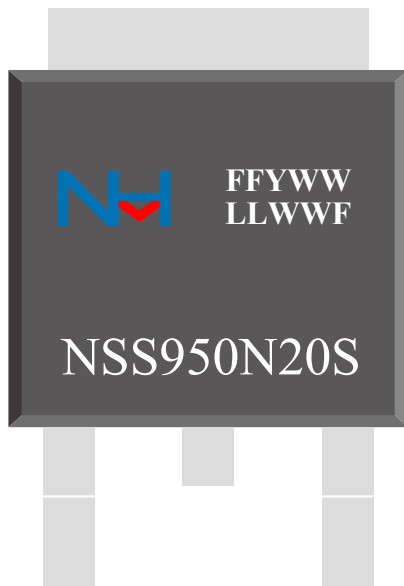
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	6.09	-	-	0.2398	-
B	-	7.57	-	-	0.2980	-
C	-	6.64	-	-	0.2610	-
D	-	2.30	-	-	0.0910	-
E	-	2.76	-	-	0.1090	-
F	-	1.42	-	-	0.0560	-

NSS950N20S

N-Channel Enhanced Shielded Gate Trench Power MOSFET



MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Nihang Trademark

FF=Product Line Code,According To Actual Changes

YWW=Date Code,According To Actual Changes

LLWWF=Internal Code,According To Actual Changes

NSS950N20S=Model

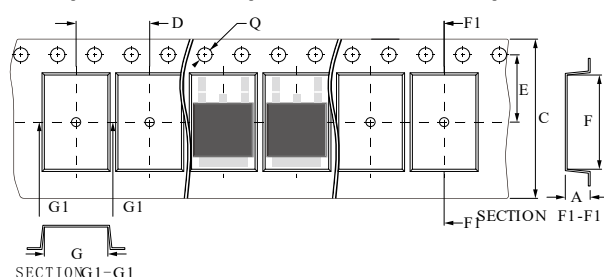
PACKAGING

TAPE

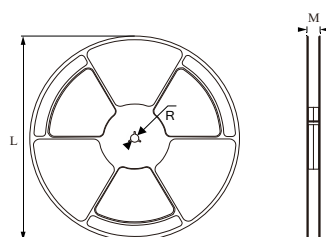
Trailer Tape

Components

Leader Tape



TAPE



TO-252

OUTLINE DIMENSIONS

Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
TAPE						
A	2.60	-	2.80	0.1024	-	0.1102
C	15.60	-	16.40	0.6142	-	0.6457
D	7.70	-	8.30	0.3031	-	0.3268
E	7.30	-	7.70	0.2874	-	0.3031
F	10.20	-	10.80	0.4016	-	0.4252
G	6.70	-	7.10	0.2638	-	0.2795
Q Φ	1.40	-	1.60	0.0551	-	0.0630
REEL						
L	328.00	-	332.00	12.913	-	13.071
R	12.00	-	14.00	0.4724	-	0.5512
M	19.40	-	23.40	0.7638	-	0.9213

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
TO-252	P1	0.321	13" Reel	2500	5000	30000
TO-252	P2	0.321	13" Reel	2500	2500	25000

NSS950N20S

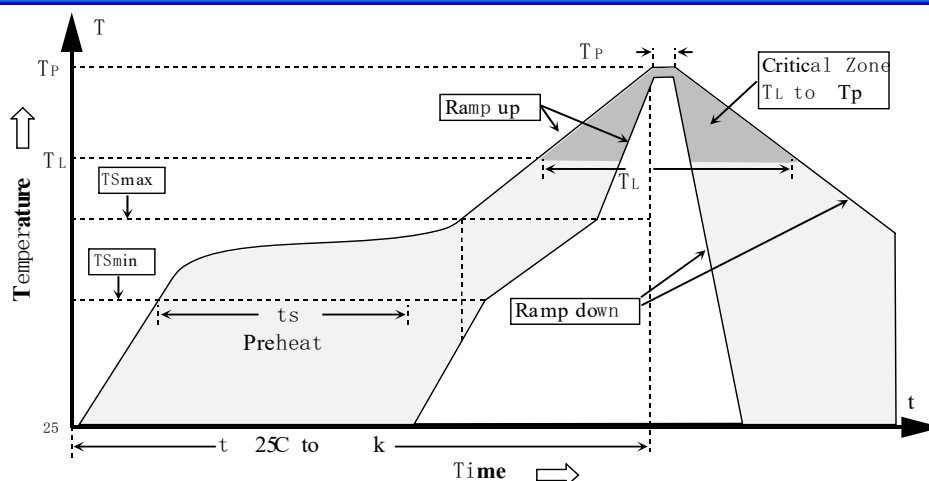
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Recommended wave soldering condition

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 (Tsmx to TP)	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.

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