

NSH036N12D



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Voltage: 120 Volts

Current: 167 Ampers

Package: TO-263

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)

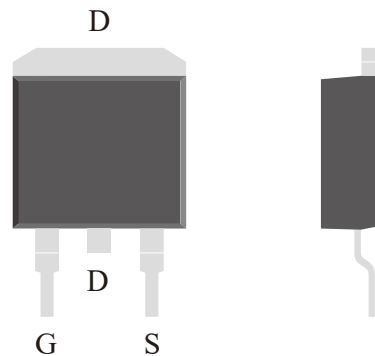
Typical Applications

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

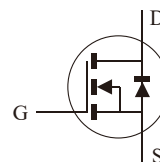
Product Summary

V _{DS} Min.@T _j	120	V
I _D Min.@T _a	167	A
R _{DS(ON)} (TYP)@10V	3.6	mΩ

Diagram:



Polarity:



***100% UIS TESTED**

***100% ΔV_{DS} TESTED**

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

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	120	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	T _a = 25 ℃	I _D	167	A
	T _a = 100 ℃		134	
Drain Current-Pulse (Note 1)	T _j < 175 ℃	I _{DM}	502	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	T _a = 25 ℃	P _D	300	W
	T _a = 100 ℃		150	
Derating Factor		D _F	2.0	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	40	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH	E _{AS}	400	mJ
	I _{AS} = 40 A, R _G = 10 Ω Starting T _j =25 ℃, V _G = 10 V			

Thermal Characteristics (T_a=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 175	℃
Storage Temperature Range		T _{STD}	-55 to 175	℃
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With T _a =25℃	R _{θJA}	60.0	℃/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	0.5	

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

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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}	120	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.11	--	V/℃
Drain-Source Leakage Current	VDS= 120 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}	--	80	--	S
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	2.0	3.0	4.0	V
Drain-Source On Resistance	ID= 20.0 A,VGS= 10.0 V	R _{DS(ON)}	--	3.6	4.4	mΩ
	ID= 20.0 A,VGS= 4.5 V		--	4.7	6.6	
Dynamic Characteristics						
Gate Resistance	VGS=0V,VDS=0V, Freq.=1MHz	R _g	--	2.7	--	Ω
Input Capacitance	VDS= 50 V	C _{iss}	--	5360.0	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	626.0	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	13.0	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 60 V	t _{d(on)}	--	22.0	--	ns
Turn-On Rise Time	VGS= 10.0 V	t _r	--	16.0	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	31.0	--	ns
Turn-Off Rise Time		t _f	--	9.6	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 60 V	Q _g	--	63.0	--	nC
Gate-Source Charge	VGS= 10.0 V	Q _{gs}	--	28.0	--	nC
Gate-Drain Charge	ID= 20.0 A	Q _{gd}	--	7.5	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _S	--	--	167	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	502	A
Diode Forward Voltage	ID= 20.0 A,VGS=0V	V _{SD}	--	0.7	1.2	V
Reverse Recovery Time	IS= 20.0 A,di/dt= 100 A/us	t _{rr}	--	52	--	ns
Reverse Recovery Charge	VGS= 0.0 V	Q _{rr}	--	312	--	nC
Reverse Recovery Current		I _{RRM}	--	12.0	--	A

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Typical Characteristics Curves

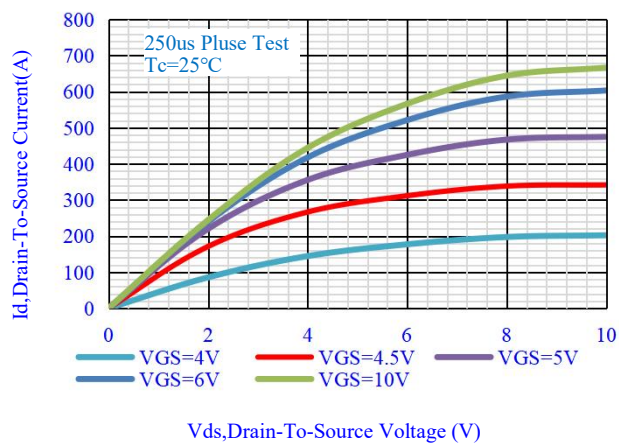


Fig.1-Output Characteristics

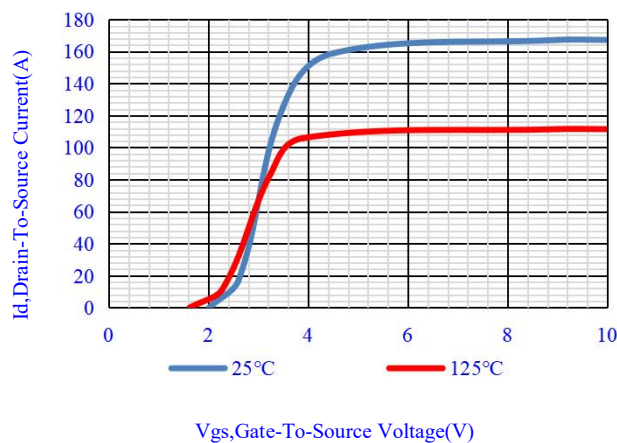


Fig.2-Transfer Characteristics

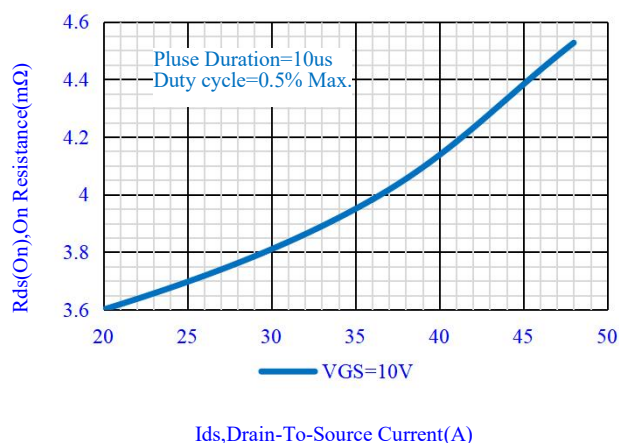


Fig.3-On Resistance Vs. Drain Current

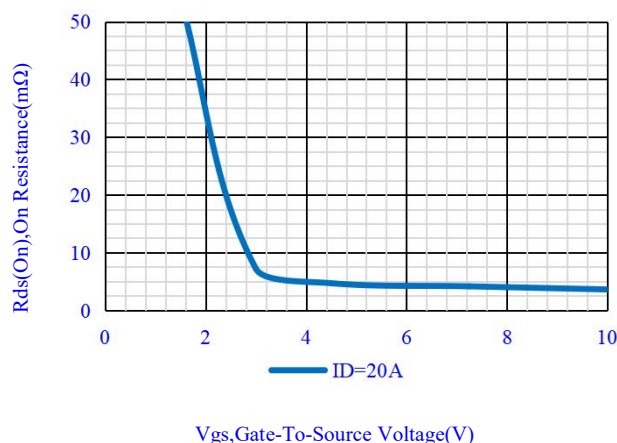


Fig.4-On Resistance Vs. Gate Source Voltage

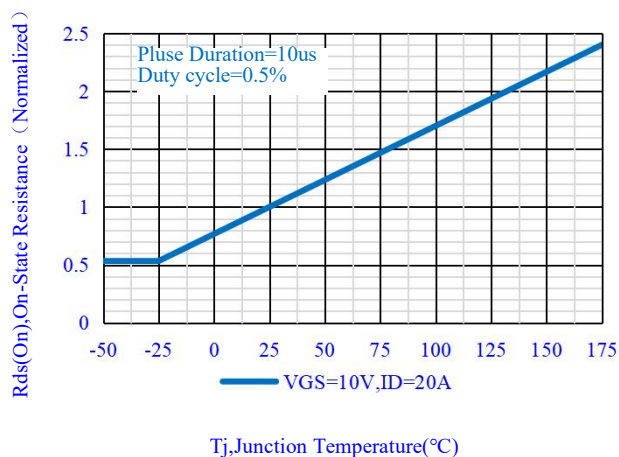


Fig.5-On Resistance Vs. Junction Temperature

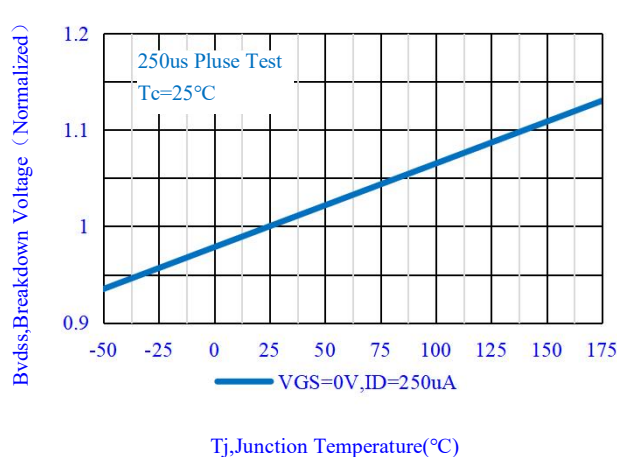


Fig.6-Breakdown Voltage Vs. Junction Temperature

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Typical Characteristics Curves

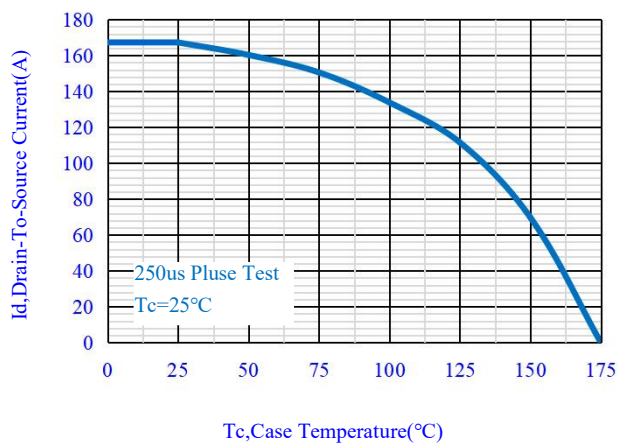


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

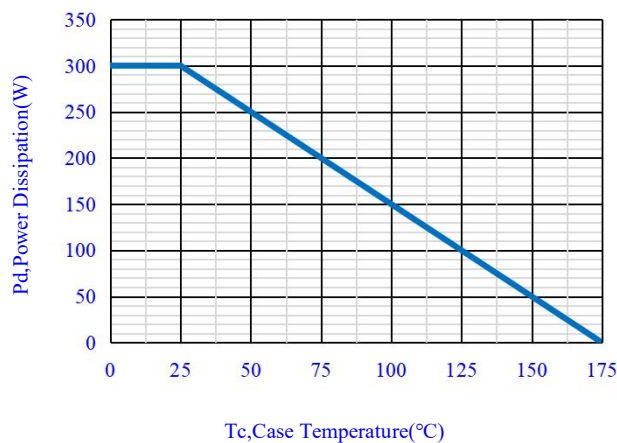


Fig.8-Maximum Power Dissipation Vs. Case Temperature

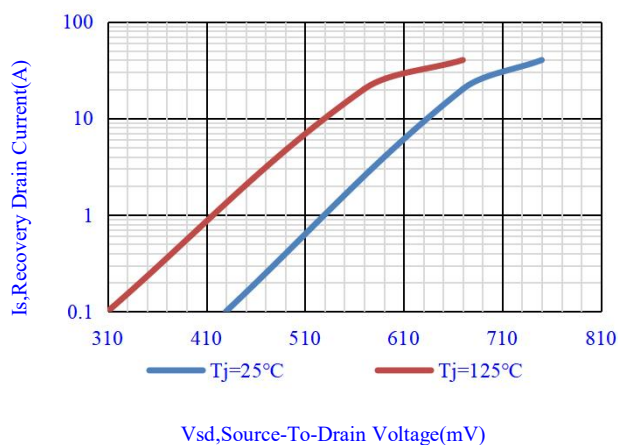


Fig.9-Source-To-Drain Diode Forward Voltage

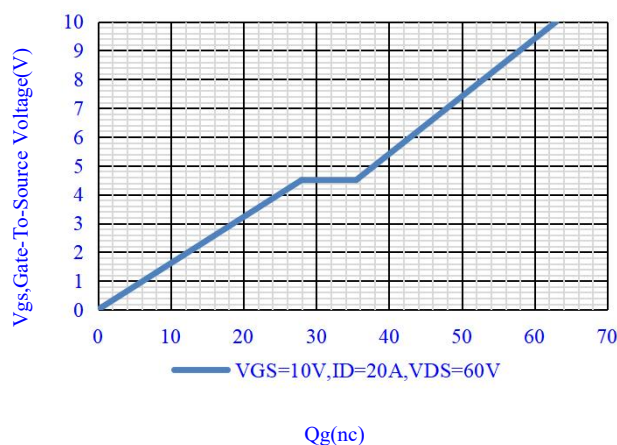


Fig.10-Gate Charge Waveform

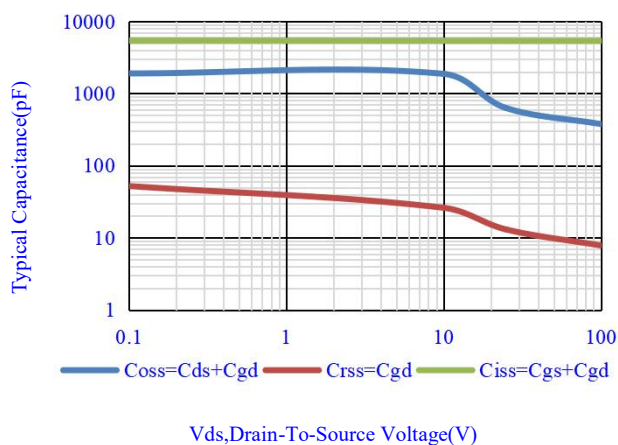


Fig.11-Typical Capacitance Vs. Drain-To-Source Voltage

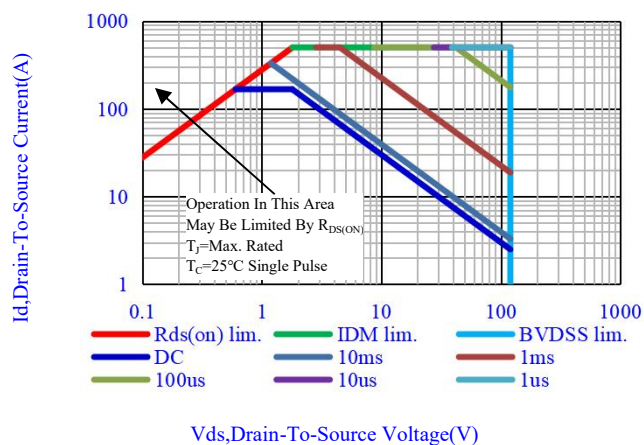


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

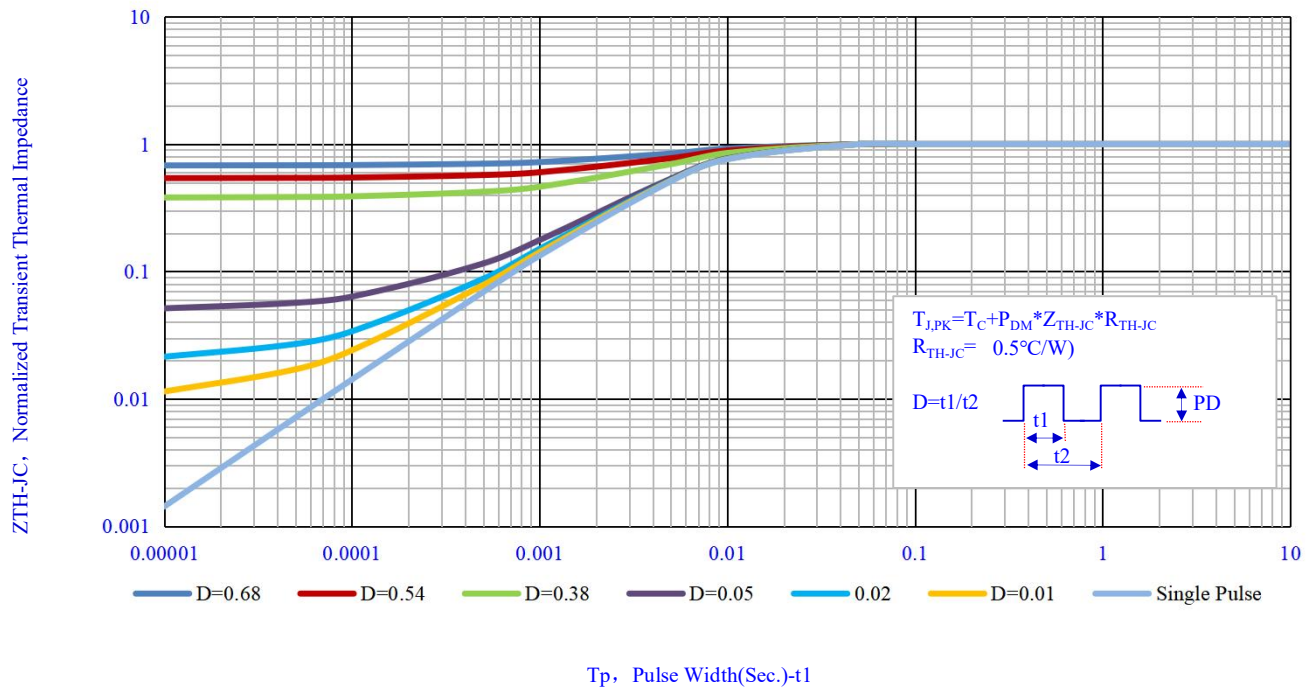


Fig.13- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

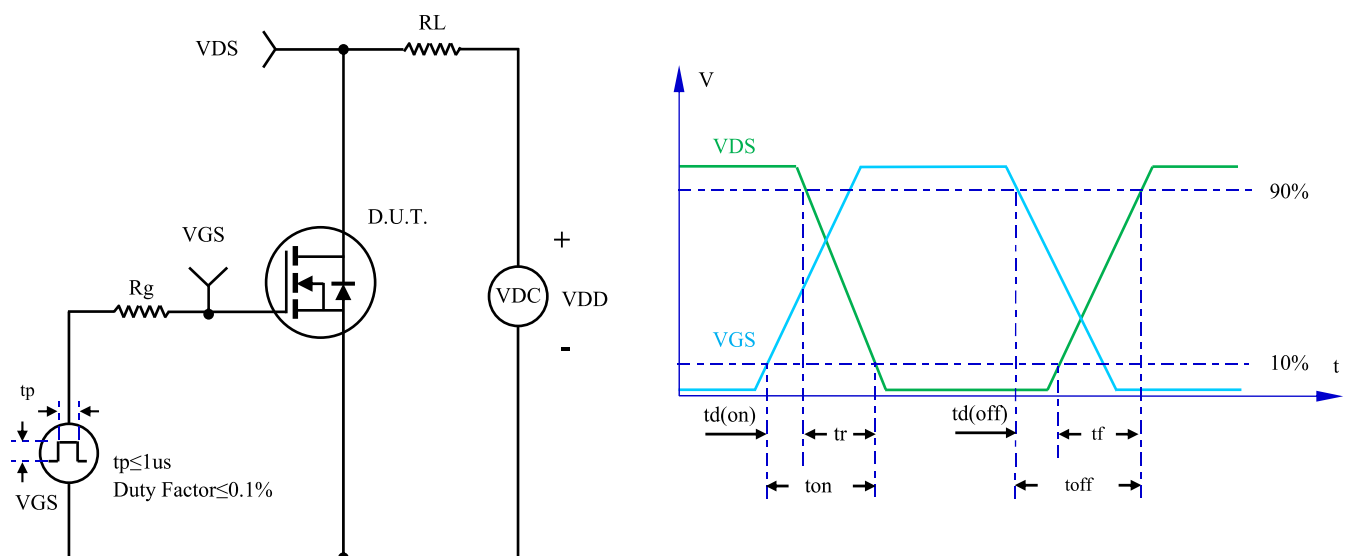


Fig.14- Resistive Switching Test Circuit & Waveform

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Test Circuit & Waveform

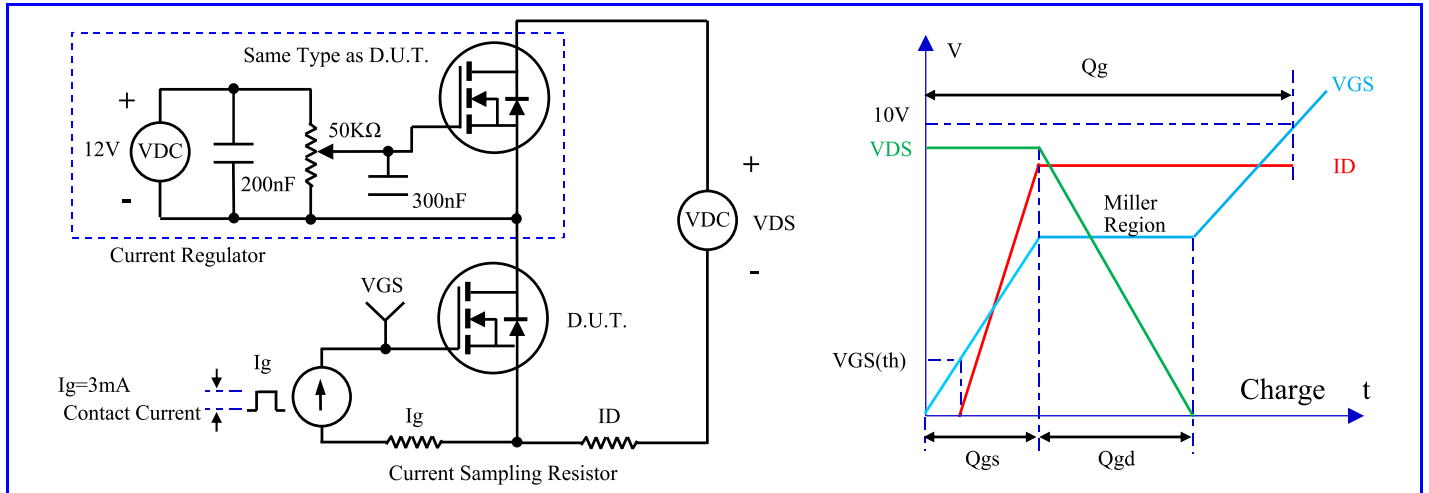


Fig.15- Gate Charge Test Circuit & Waveform

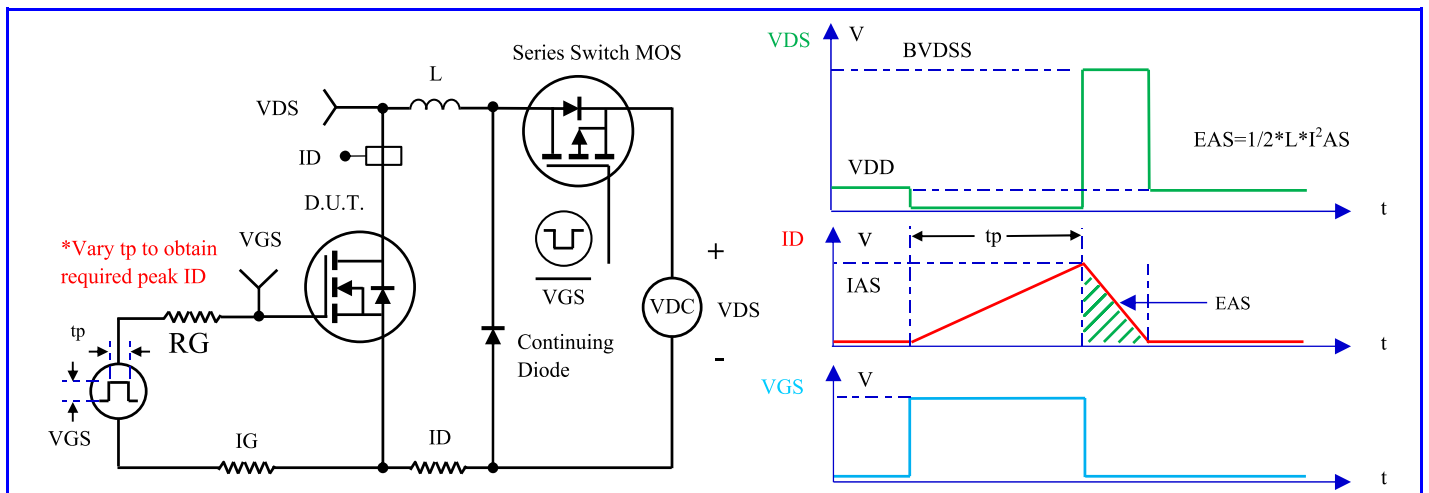


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

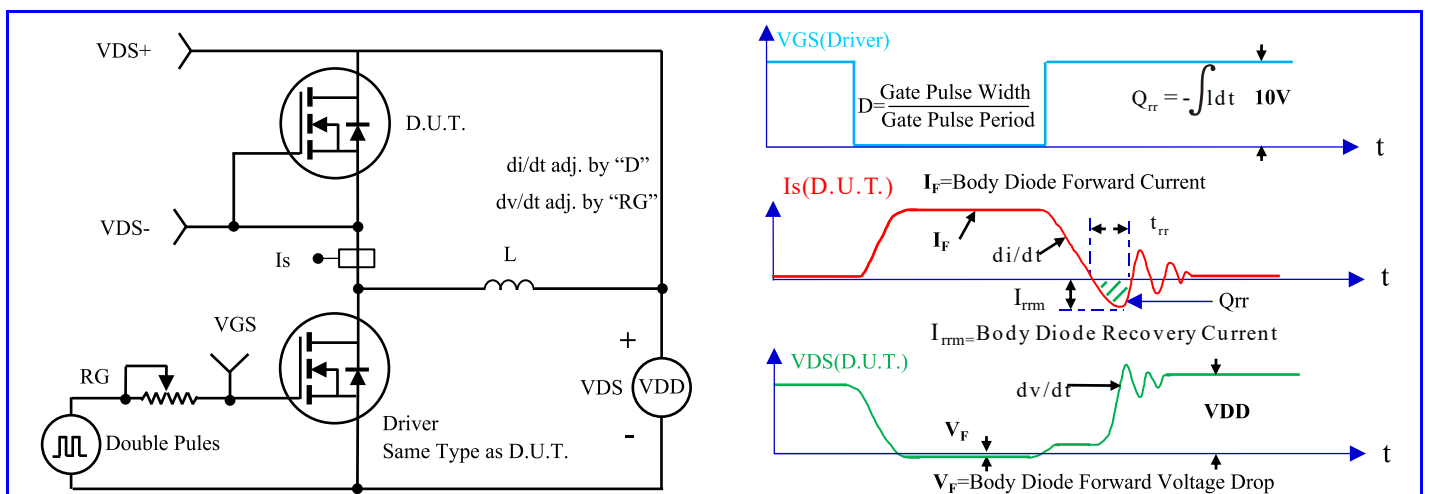


Fig.17- Diode Recovery Test Circuit & Waveform

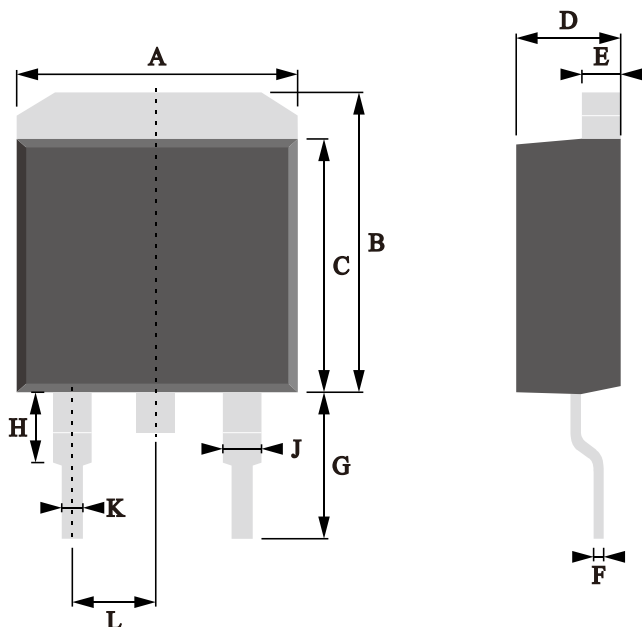
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OUTLINE DRAWINGS

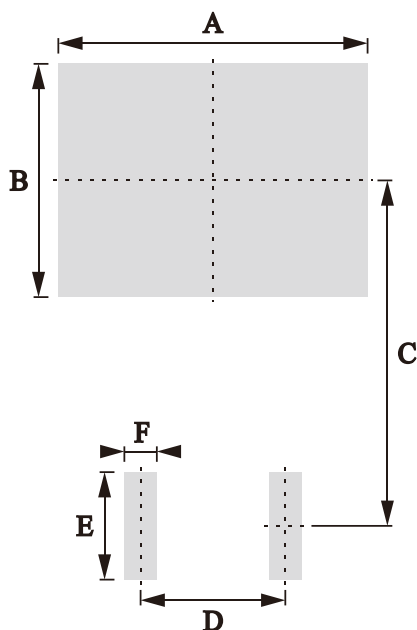
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OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.30	-	10.50	0.3661	-	0.4134
B	9.60	-	11.60	0.3780	-	0.4567
C	8.20	-	9.50	0.3228	-	0.3740
D	4.00	-	5.00	0.1575	-	0.1969
E	1.00	-	1.70	0.0394	-	0.0669
F	0.20	-	0.70	0.0079	-	0.0276
G	4.45	-	5.25	0.1752	-	0.2067
H	1.25	-	1.85	0.0492	-	0.0728
J	1.00	-	1.60	0.0394	-	0.0630
K	0.60	-	1.00	0.0236	-	0.0394
L	2.25	-	2.80	0.0886	-	0.1102

RECOMMENDED LAYOUT DRAWINGS

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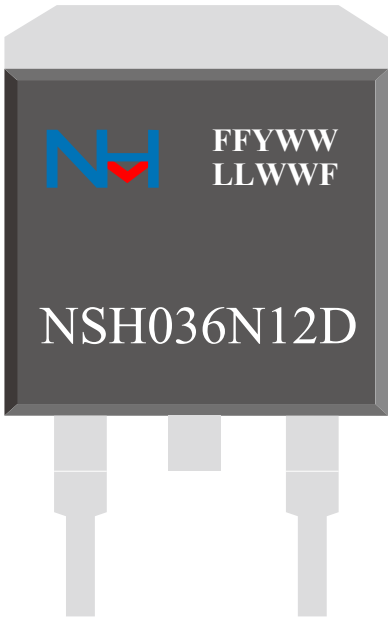
OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	10.86	-	-	0.4276	-
B	-	7.86	-	-	0.3094	-
C	-	11.64	-	-	0.4583	-
D	-	5.08	-	-	0.2000	-
E	-	3.62	-	-	0.1090	-
F	-	1.14	-	-	0.0560	-

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MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhang Trademark
FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWWF=Inernal Code,According To Actual Changes
NSH036N12D=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)
TO-263	P1	1.4331	13" Reel	800	800	4800
TO-263	P2	1.4331	13" Reel	1000	1000	6000

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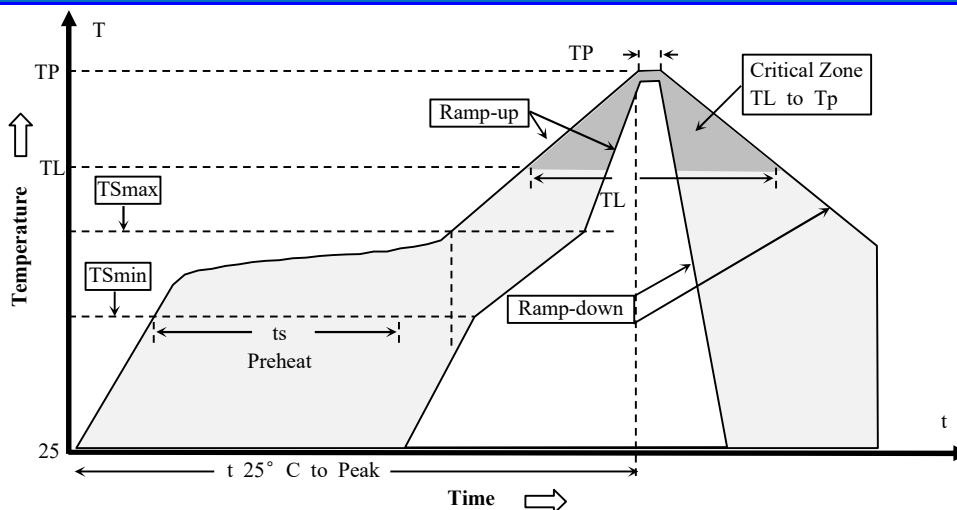
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Recommended wave soldering condition

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 (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.

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