

NSH160N15C



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Voltage: 150 Volts

Current: 54 Amperes

Package: TO-220C

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)

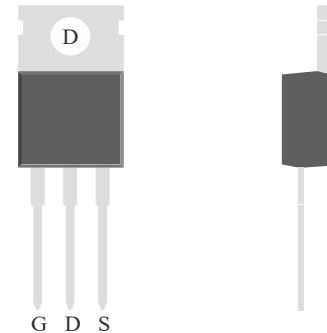
Typical Applications

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

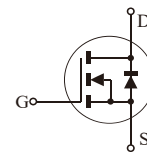
Product Summary

V _{DS} Min.@T _j	150	V
I _D Min.@T _a	54	A
R _{DS(ON)} (TYP)@10V	16	mΩ

Diagram:



Polarity:



*100% UIS TESTED

*100% ΔV_{DS} TESTED

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

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V _{DS}	150	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	T _a = 25 °C	I _D	54	A
	T _a = 100 °C		35	
Drain Current-Pulse (Note 1)	T _j < 150 °C	I _{DM}	218	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25°C	T _a = 25 °C	P _D	125	W
	T _a = 100 °C		50	
Derating Factor		D _F	1.00	W/°C
Avalanche Current, Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	20	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.17	L= 0.5 mH	E _{AS}	100	mJ
	I _{AS} = 20 A, R _G = 10.0 Ω Starting T _j =25 °C, V _G = 10.0 V			

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

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T _J	-55 to 150	°C
Storage Temperature Range		T _{STD}	-55 to 150	°C
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With T _a =25°C	R _{θJA}	62.5	°C/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 75mm x 45mm x 2.5mm Alu. Heat.	R _{θJC}	1	

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig.14)

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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}	150	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.17	--	V/℃
Drain-Source Leakage Current	VDS= 150 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}	--	55	--	S
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	V _{GS(TH)}	2	3	4	V
Drain-Source On Resistance	ID= 20.0 A,VGS= 10.0 V	R _{DS(ON)}	--	16	19	mΩ
	ID= 20.0 A,VGS= 6.0 V		--	23	29	
Dynamic Characteristics						
Gate Resistance	VGS=0V,VDS=0V, Freq.=1MHz	R _g	--	2.2	--	Ω
Input Capacitance	VDS= 75 V	C _{iss}	--	1950	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	130	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	8	--	pF
Switching Paramters With Inductive Load(Test Circuit & Waveform See Fig.15)						
Turn-On Delay Time	VDS= 50 V	t _{d(on)}	--	9	--	ns
Turn-On Rise Time	VGS= 10.0 V	t _r	--	7	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	15	--	ns
Turn-Off Rise Time	L= 0.5 mH	t _f	--	8	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.16)						
Total Gate Charge	VDS= 50 V	Q _g	--	25	--	nC
Gate-Source Charge	VGS= 10.0 V	Q _{gs}	--	8	--	nC
Gate-Drain Charge	ID= 20.0 A	Q _{gd}	--	3	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.18)						
Max. Diode Forward Current		I _s	--	--	54.5	A
Max. Pulsed Forward Current		I _{SM}	--	--	218	A
Diode Forward Voltage	ID= 20.0 A,VGS=0V	V _{SD}	--	0.9	1.2	V
Reverse Recovery Time	IS= 20.0 A,di/dt= 100 A/us	t _{rr}	--	60	--	ns
Reverse Recovery Charge	VGS= 0.0 V	Q _{rr}	--	120	--	nC
Reverse Recovery Current		I _{RRM}	--	4.0	--	A

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Typical Characteristics Curves

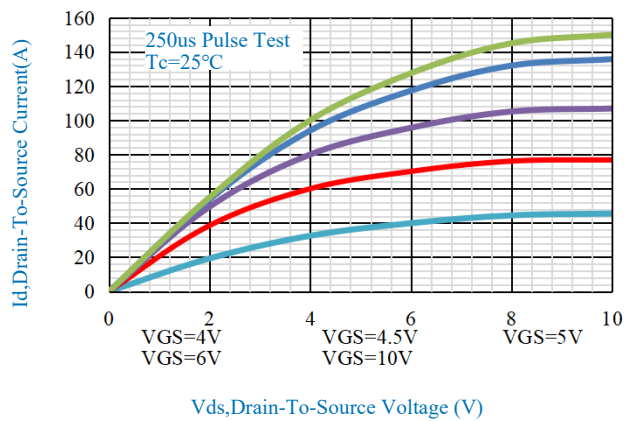


Fig.1-Output Characteristic

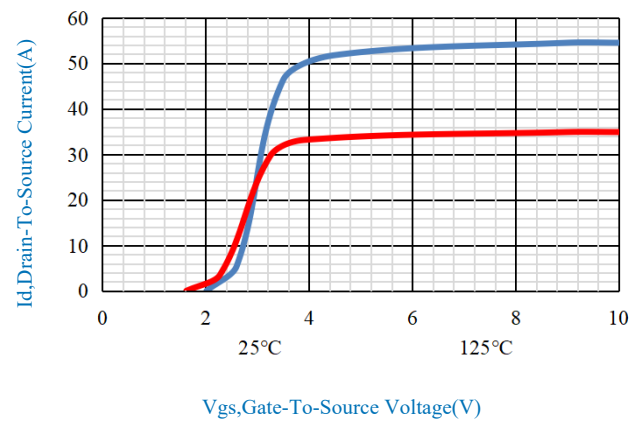


Fig.2-Transfer Characteristic

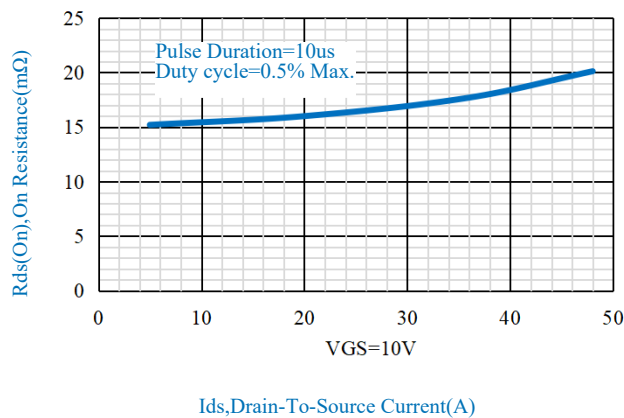


Fig.3-On Resistance Vs. Drain Current

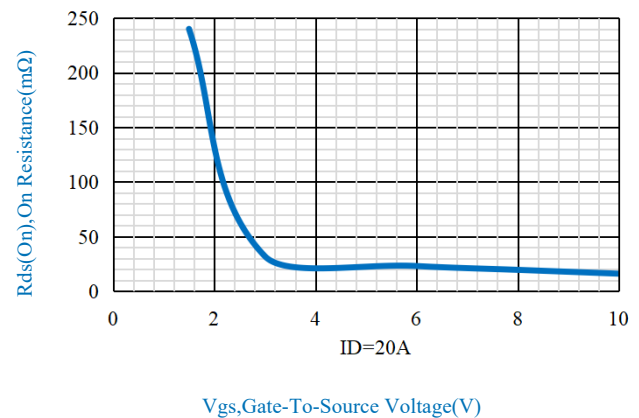


Fig.4-On Resistance Vs. Gate Source Voltage

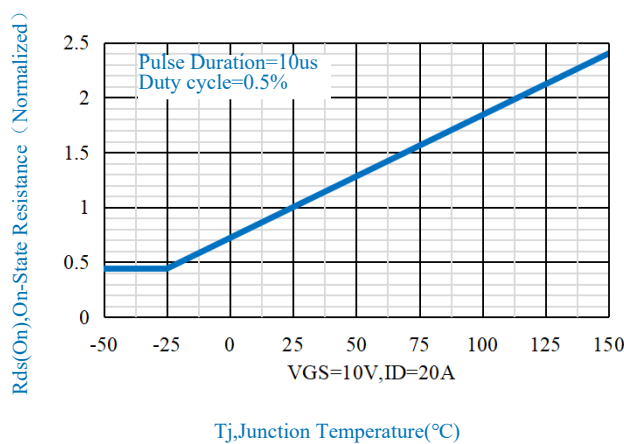


Fig.5-On Resistance Vs. Junction Temperature

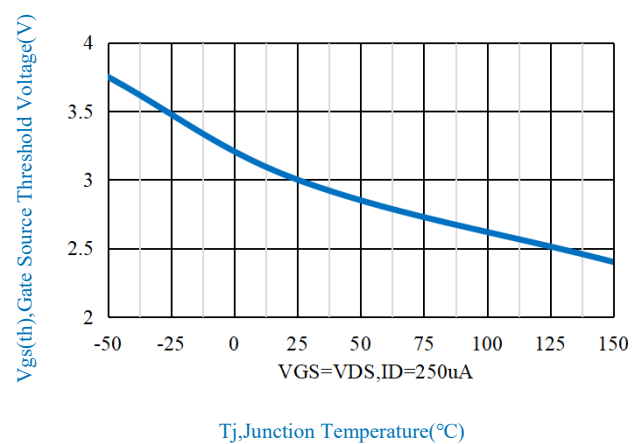


Fig.6-Gate Source Threshold Voltage Vs. Junction Temperature

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Typical Characteristics Curves

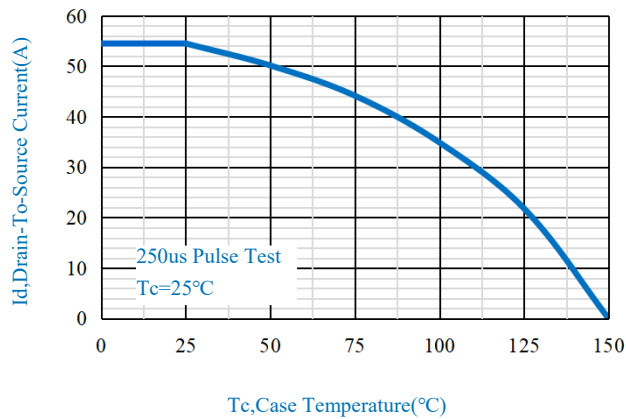


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

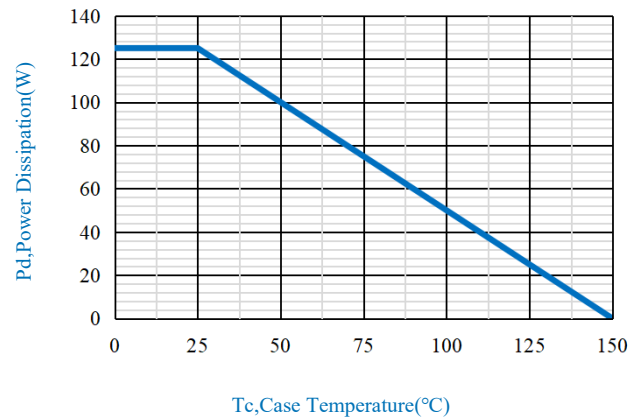


Fig.8-Maximum Power Dissipation Vs. Case Temperature

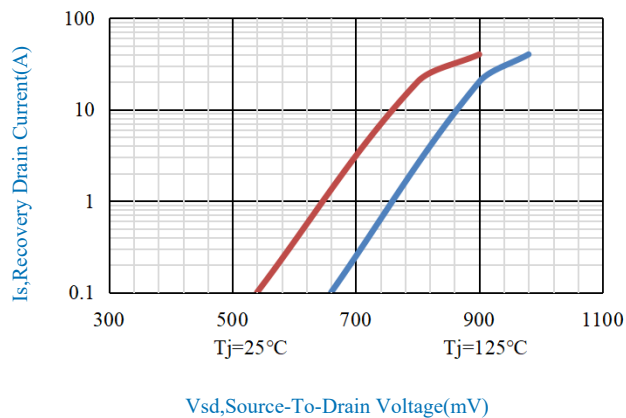


Fig.9-Source-To-Drain Diode Forward Voltage

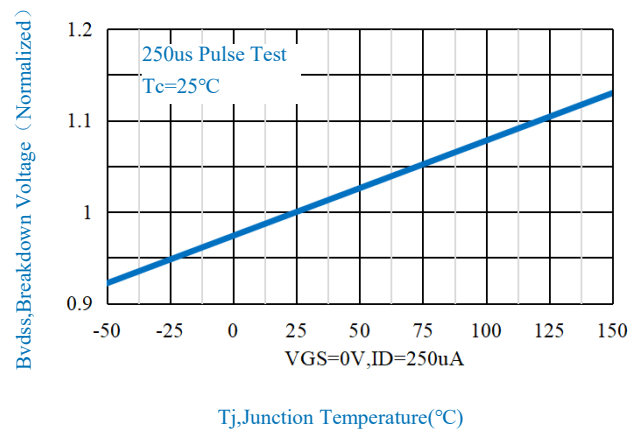


Fig.10-Breakdown Voltage Vs. Junction Temperature

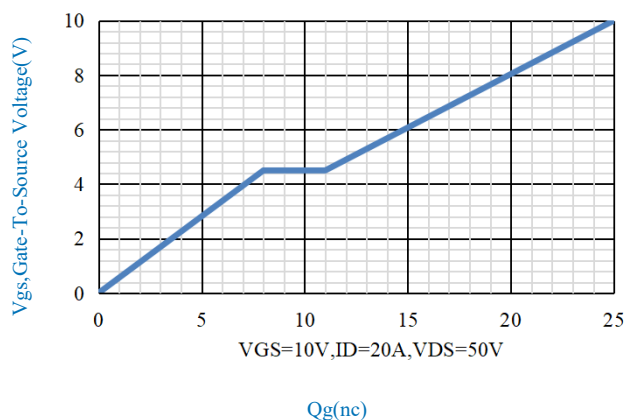


Fig.11-Gate Charge Waveform

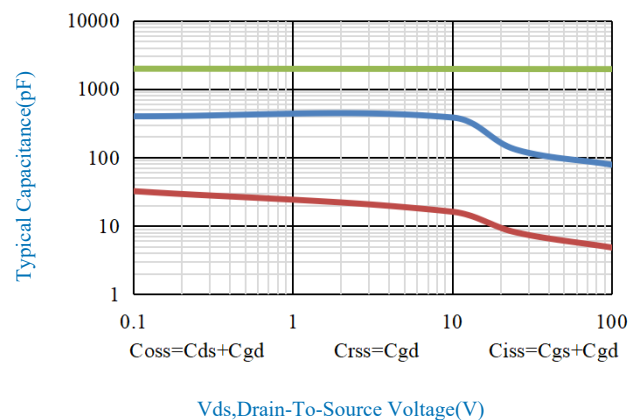


Fig.12-Typical Capacitance Vs. Drain-To-Source Voltage

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Typical Characteristics Curves

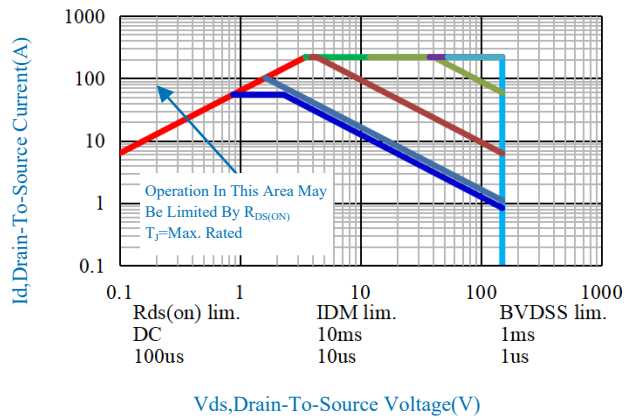


Fig.13-Maximum Safe Operating Area(SOA)

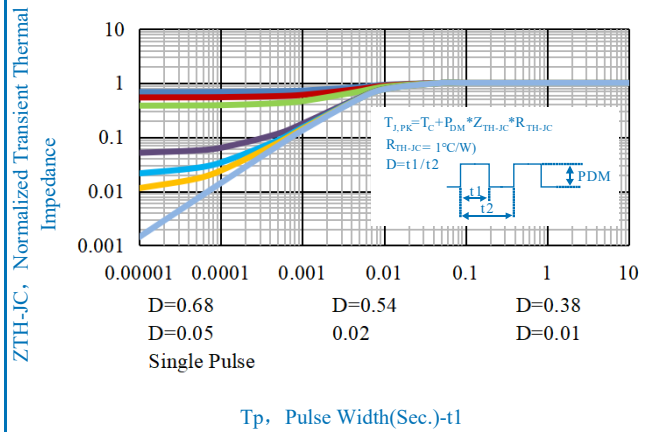


Fig.14- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Inductive Load Test Circuit & Waveform

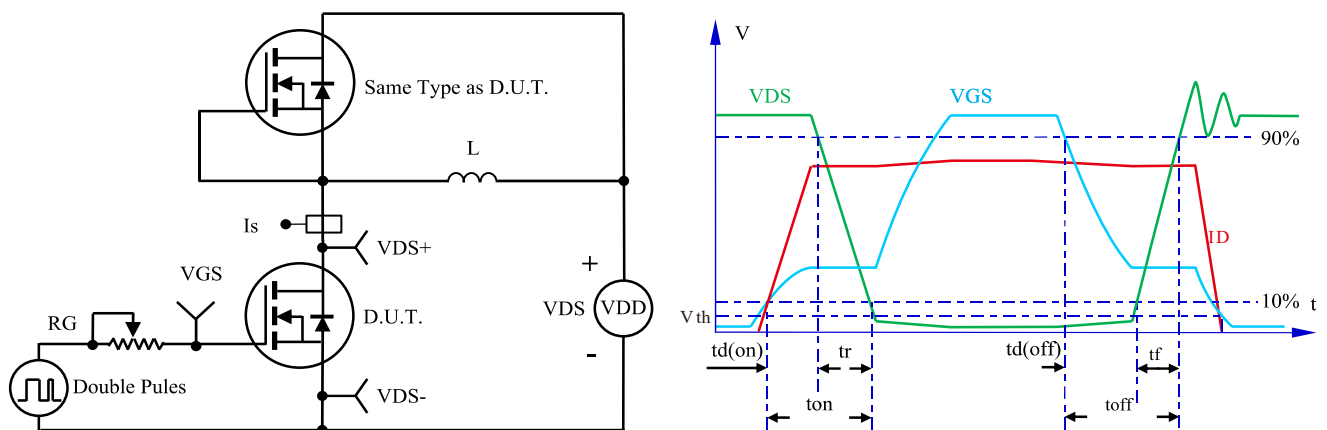


Fig.15- Inductive Switching Test Circuit & Waveform

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Test Circuit & Waveform

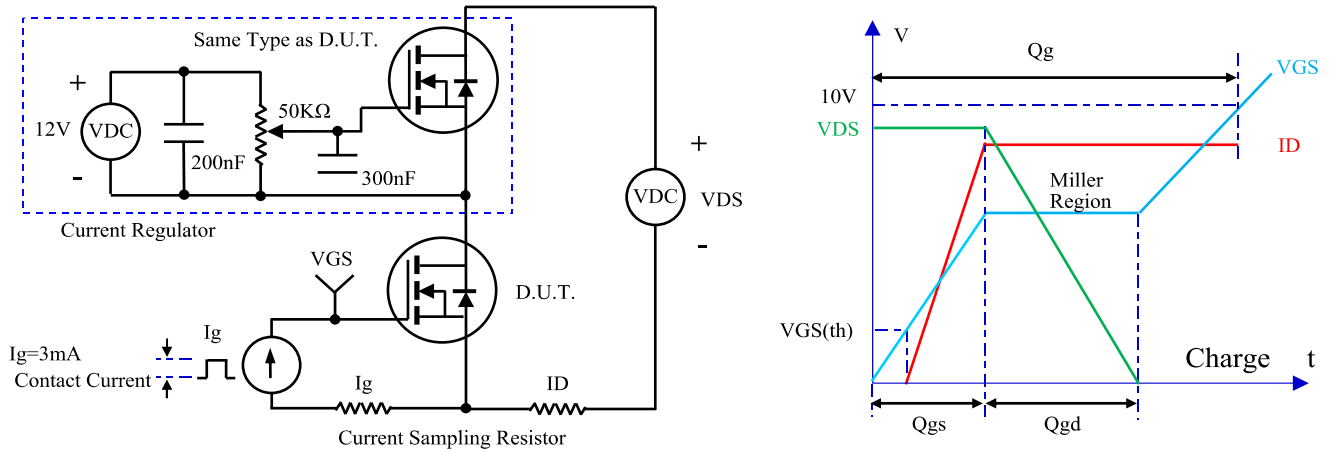


Fig.16- Gate Charge Test Circuit & Waveform

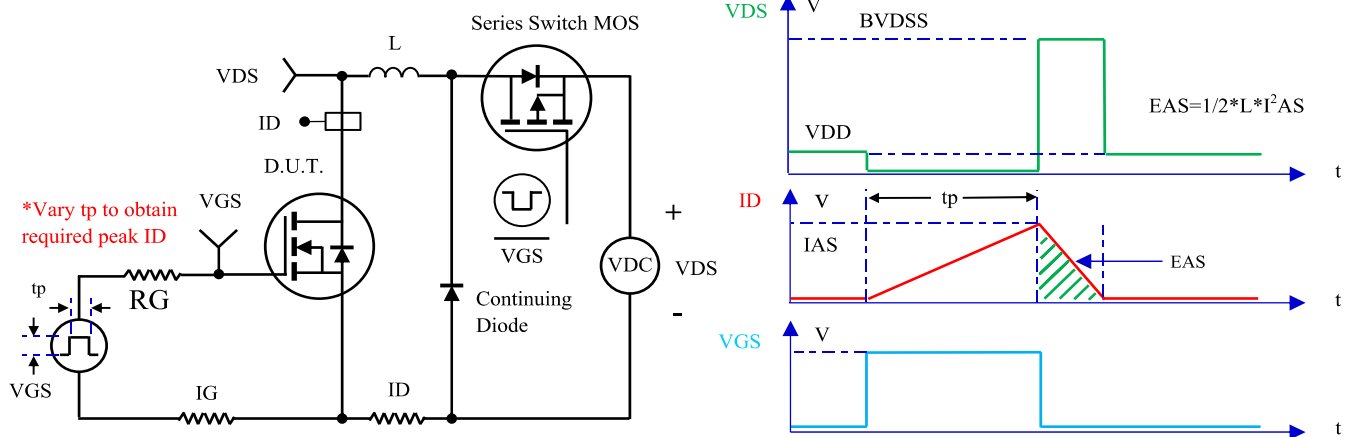


Fig.17- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

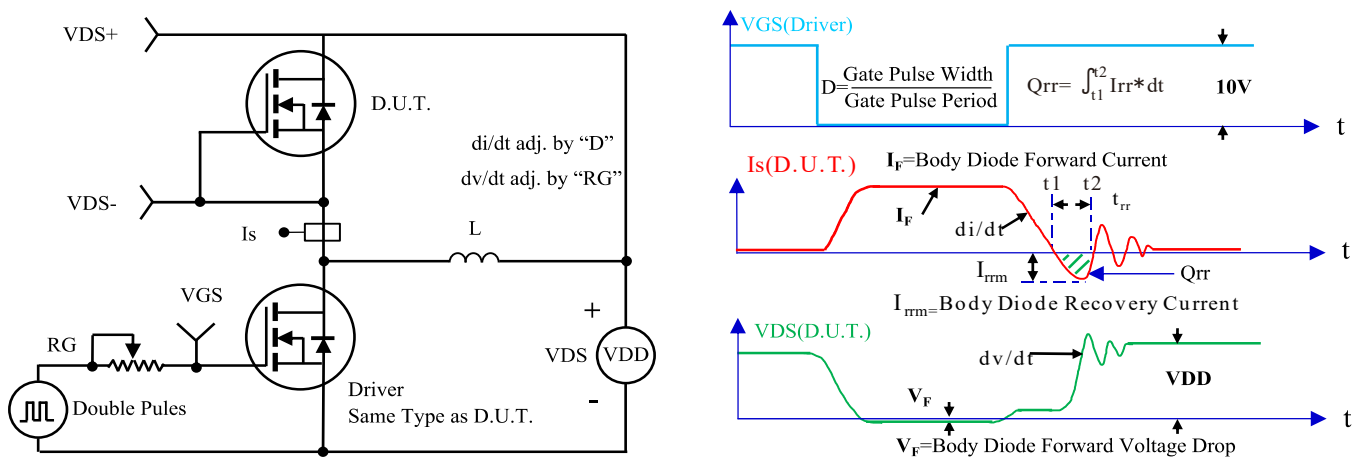


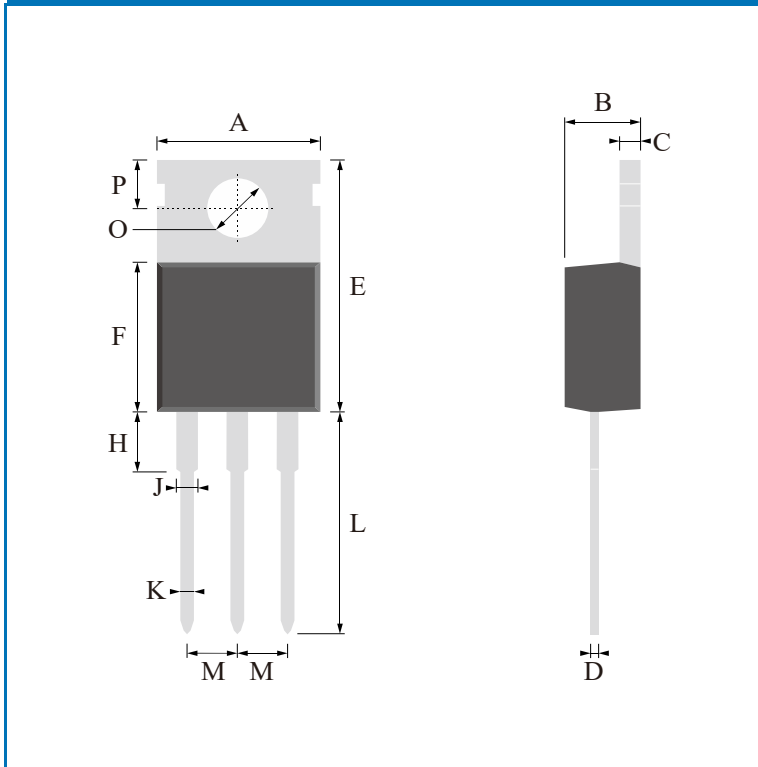
Fig.18- Diode Recovery Test Circuit & Waveform

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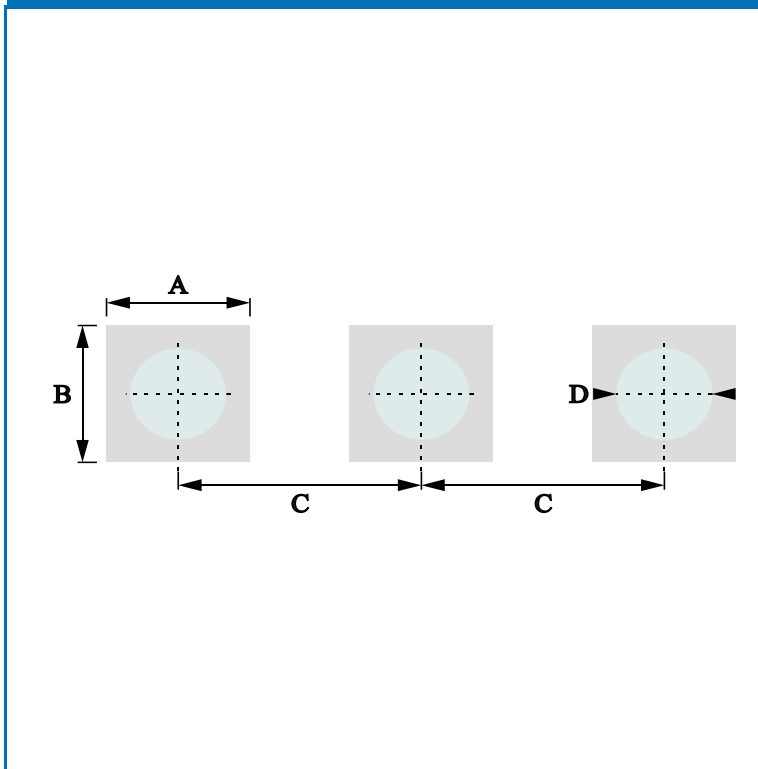
OUTLINE DRAWINGS



TO-220C

OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.25	-	10.75	0.3642	-	0.4232
B	4.15	-	4.95	0.1634	-	0.1949
C	1.10	-	1.65	0.0433	-	0.0650
D	0.25	-	0.65	0.0098	-	0.0256
E	14.50	-	16.70	0.5709	-	0.6575
F	8.40	-	9.95	0.3307	-	0.3917
L	12.15	-	14.30	0.4783	-	0.5630
H	3.00	-	3.80	0.1181	-	0.1496
J	1.05	-	1.60	0.0413	-	0.0630
K	0.65	-	0.95	0.0256	-	0.0374
M	2.10	-	2.90	0.0827	-	0.1142
O	3.20	-	4.10	0.1260	-	0.1614
P	2.45	-	3.10	0.0965	-	0.1220

RECOMMENDED LAYOUT DRAWINGS



TO-220C

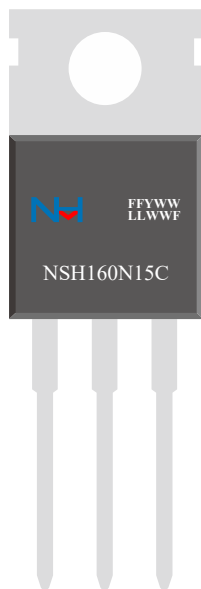
OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	1.60	-	-	0.0630	-
B	-	1.60	-	-	0.0630	-
C	-	2.54	-	-	0.1000	-
D	-	1.00	-	-	0.0394	-

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MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhan Trademark
FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWWF=Internal Code,According To Actual Changes
NSH160N15C=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-220C	P1	2.057	Tube	50	1000	5000

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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 (TSmax 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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Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2014-10-20	First Issue		
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