

NSH024N06P5



N-Channel Enhanced Shielded Gate Trench Power MOSFET

Voltage: 60 Volts

Current: 142 Ampers

Package: PDFN5*6

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)

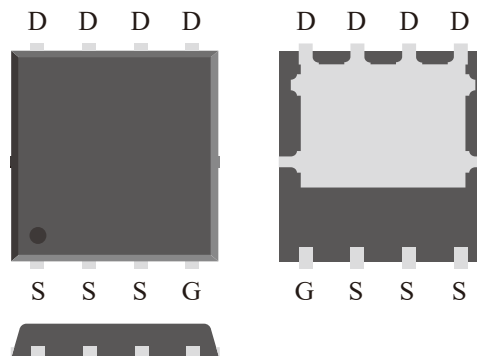
Typical Applications

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

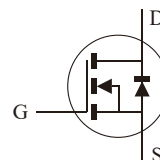
Product Summary

V _{DS} Min.@T _j	60	V
I _D Min.@T _a	142	A
R _{DS(ON)} (TYP)@10V	2.4	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}	60	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	T _a = 25 ℃	I _D	142	A
	T _a = 100 ℃		91	
Drain Current-Pulse (Note 1)	T _j < 150 ℃	I _{DM}	568	A
Maximum Power Dissipation Power	T _a = 25 ℃	P _D	109	W
	T _a = 100 ℃		43	
Derating Factor		D _F	0.87	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I _{AS}	47	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH I _{AS} = 47 A,R _G = 10.0 Ω Starting T _j =25 ℃,V _G = 10.0 V	E _{AS}	552	mJ

Thermal Characteristics (T_a=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 T _a =25℃	R _{θJA}	55	℃/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	R _{θJC}	1.15	

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}	60	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.07	--	V/℃
Drain-Source Leakage Current	VDS= 60 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}	--	35	--	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)}	--	2.4	3	mΩ
	ID= 20.0 A,VGS= 4.5 V		--	4.0	5.3	
Dynamic Characteristics						
Input Capacitance	VDS= 30 V	C _{iss}	--	3030	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	1140	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	44	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 30 V	t _{d(on)}	--	15	--	ns
Turn-On Rise Time	VGS= 10.0 V	t _r	--	25	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	32	--	ns
Turn-Off Rise Time		t _f	--	15	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 30 V	Q _g	--	60	--	nC
Gate-Source Charge	VGS= 10.0 V	Q _{gs}	--	15	--	nC
Gate-Drain Charge	ID= 20.0 A	Q _{gd}	--	10	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I _S	--	--	142	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	568	A
Diode Forward Voltage	ID= 20.0 A,VGS=0V	V _{SD}	--	0.85	1.5	V
Reverse Recovery Time	IS= 20.0 A,di/dt= 100 A/us	t _{rr}	--	50	--	ns
Reverse Recovery Charge	VGS= 0.0 V	Q _{rr}	--	57	--	nC
Reverse Recovery Current		I _{RRM}	--	2.0	--	A

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Typical Characteristics Curves

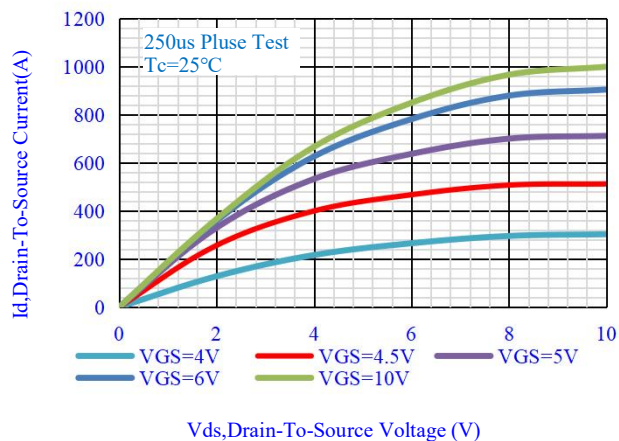


Fig.1-Output Characteristics

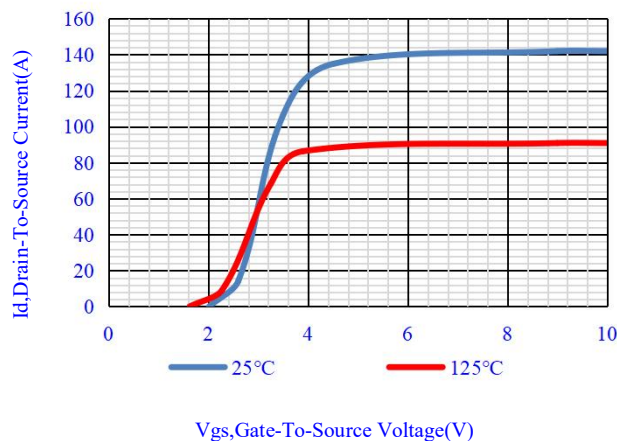


Fig.2-Transfer Characteristics

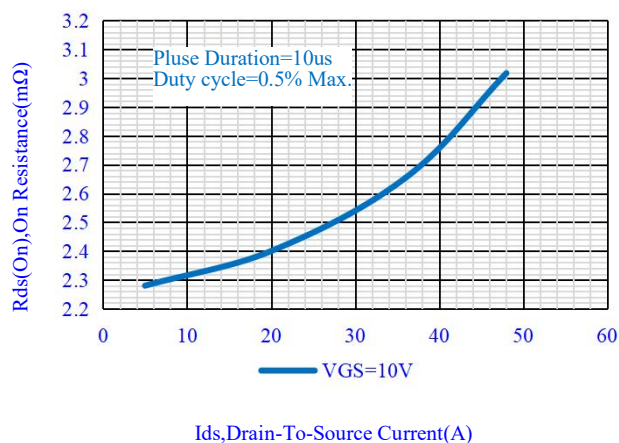


Fig.3-On Resistance Vs. Drain Current

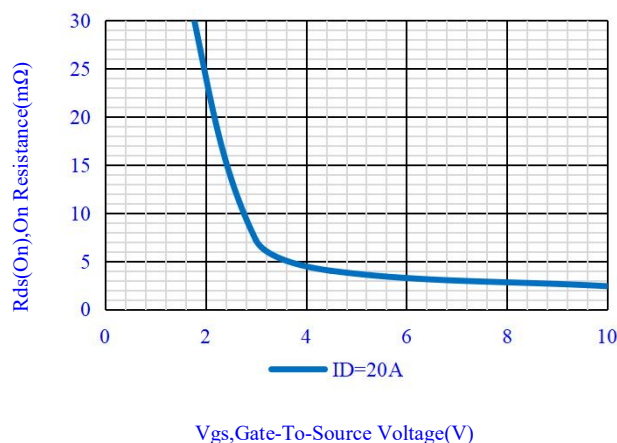


Fig.4-On Resistance Vs. Gate Source Voltage

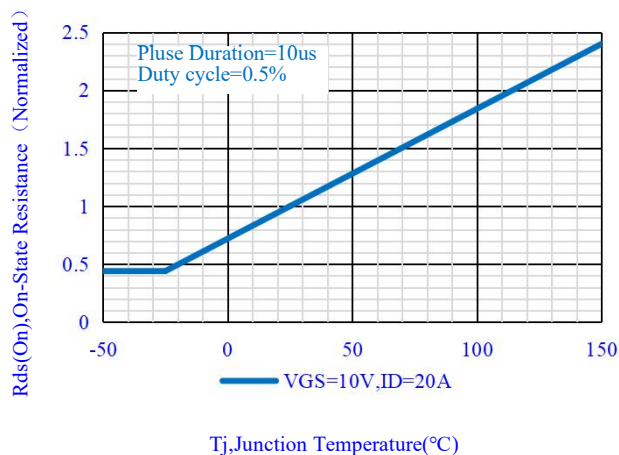


Fig.5-On Resistance Vs. Junction Temperature

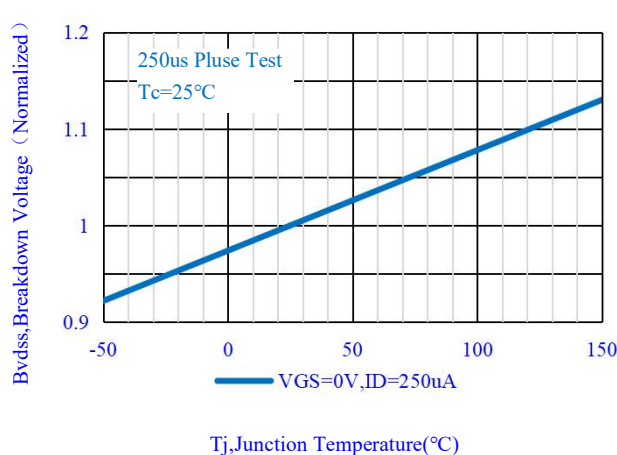


Fig.6-Breakdown Voltage Vs. Junction Temperature

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Typical Characteristics Curves

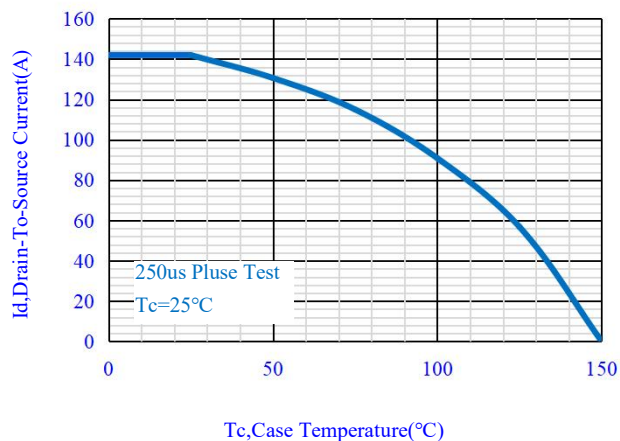


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

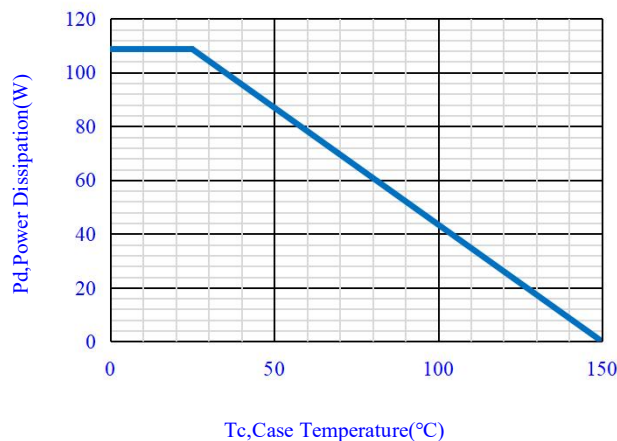


Fig.8-Maximum Power Dissipation Vs. Case Temperature

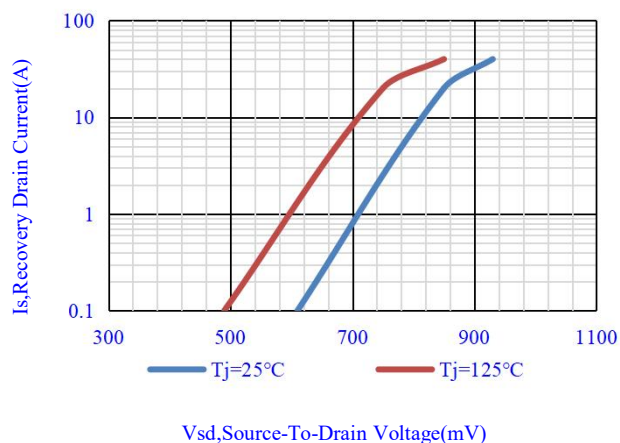


Fig.9-Source-To-Drain Diode Forward Voltage

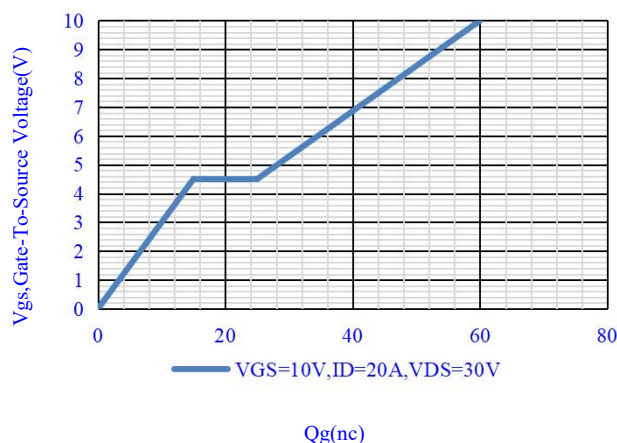


Fig.10-Gate Charge Waveform

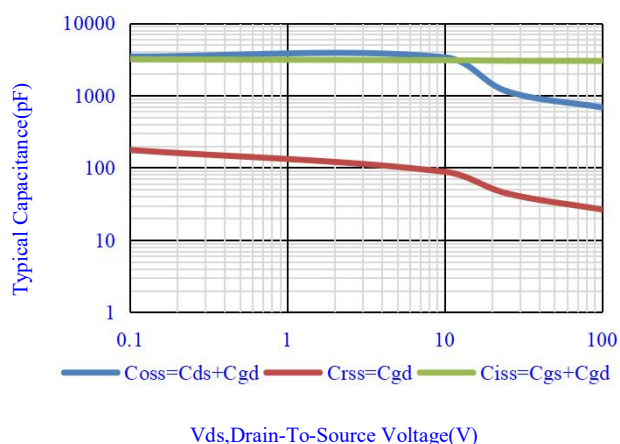


Fig.11-Typical Capacitance Vs. Drain-To-Source Voltage

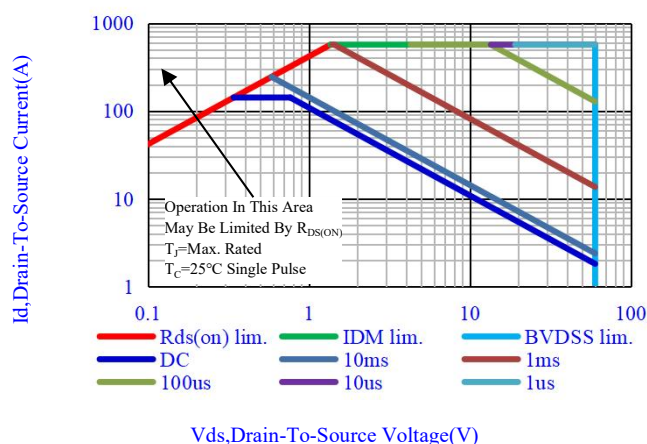


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

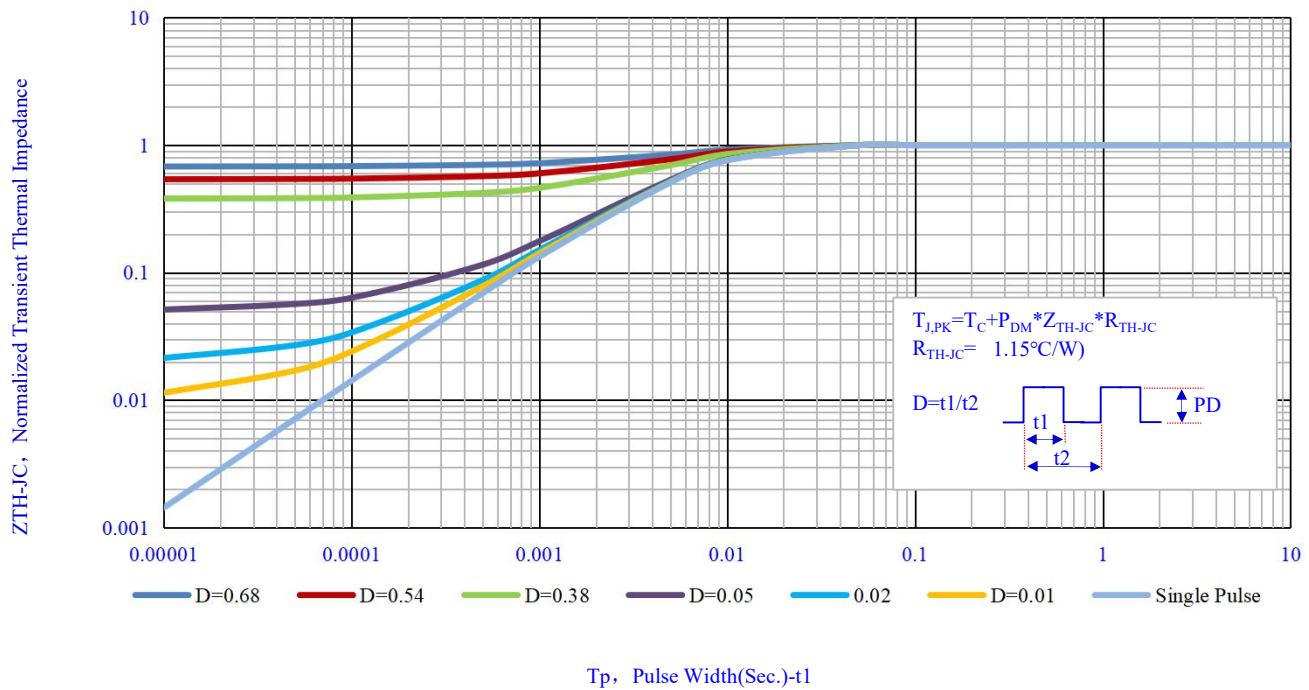


Fig.13- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

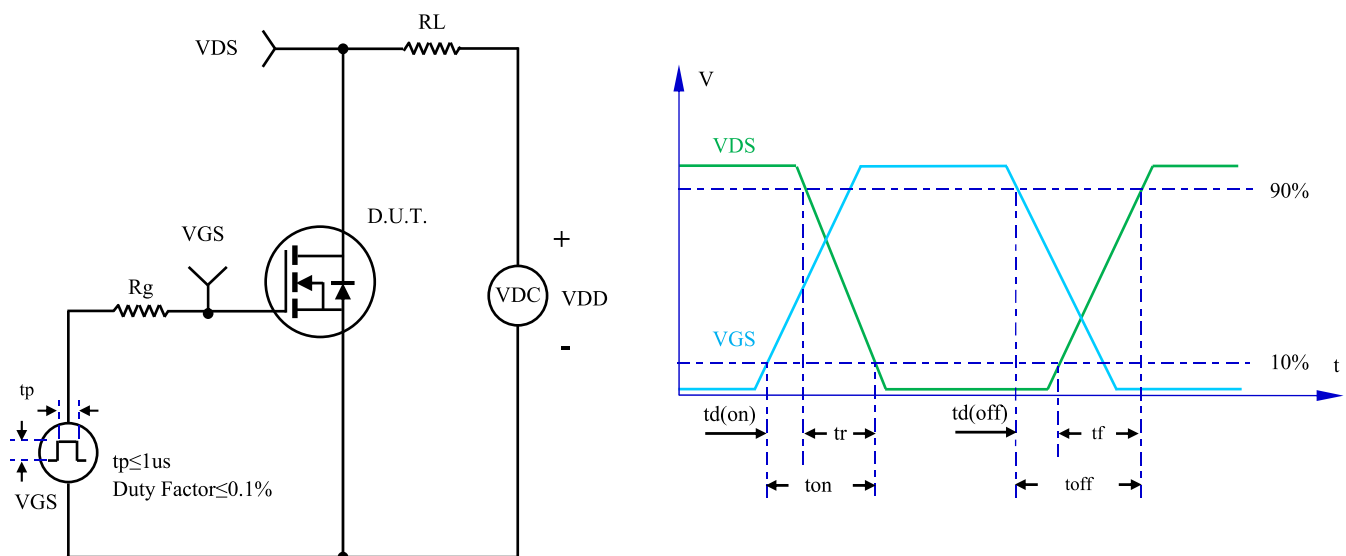


Fig.14- Resistive Switching Test Circuit & Waveform

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Test Circuit & Waveform

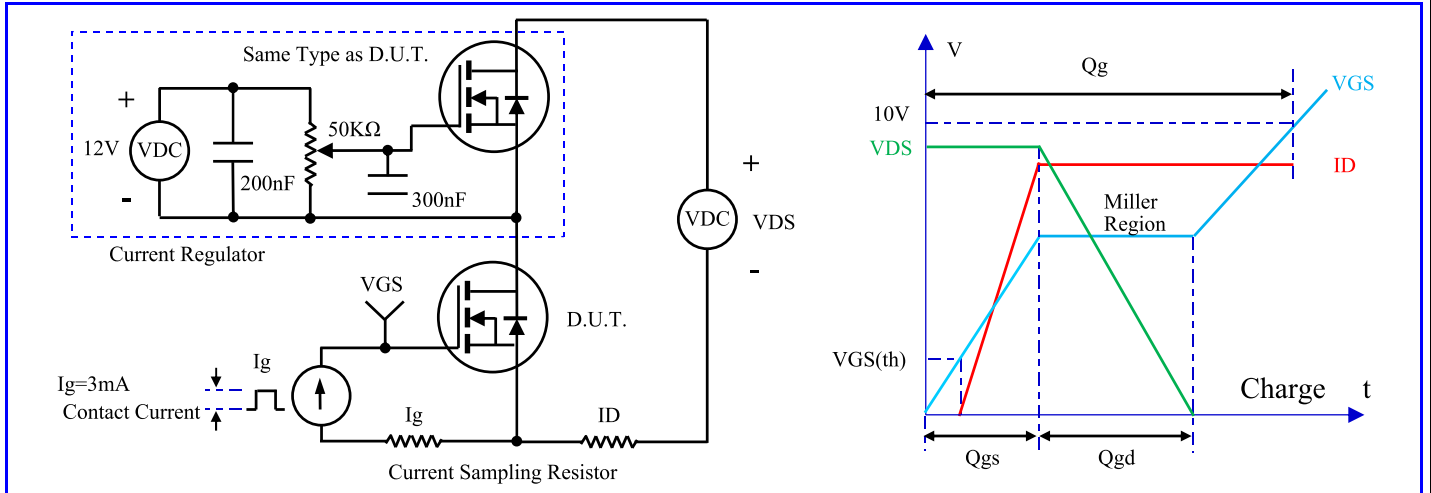


Fig.15- Gate Charge Test Circuit & Waveform

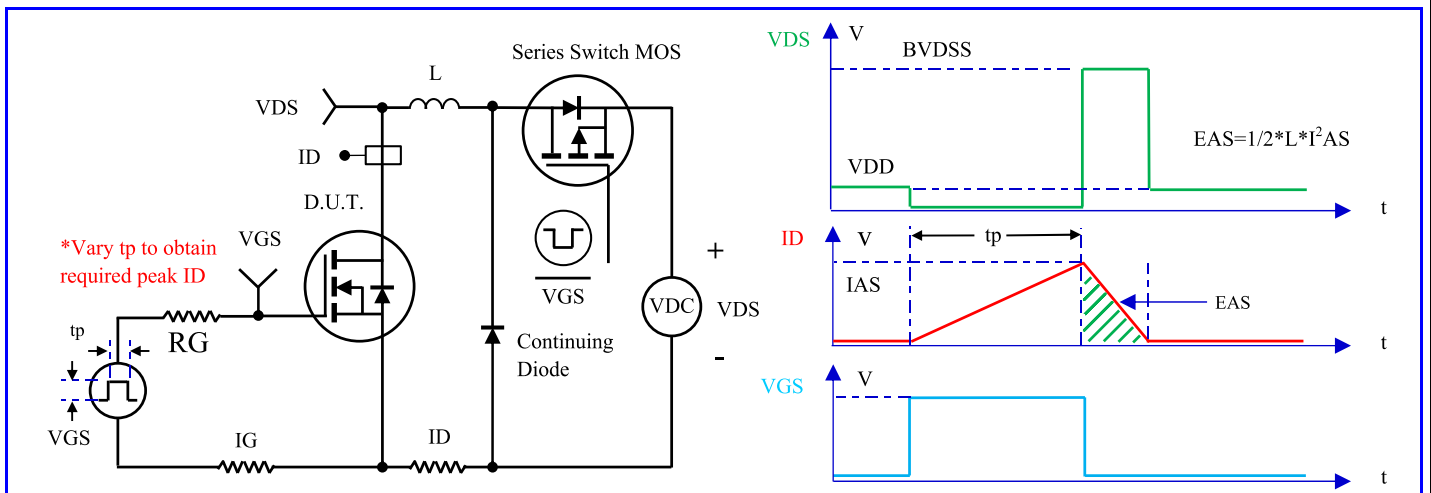


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

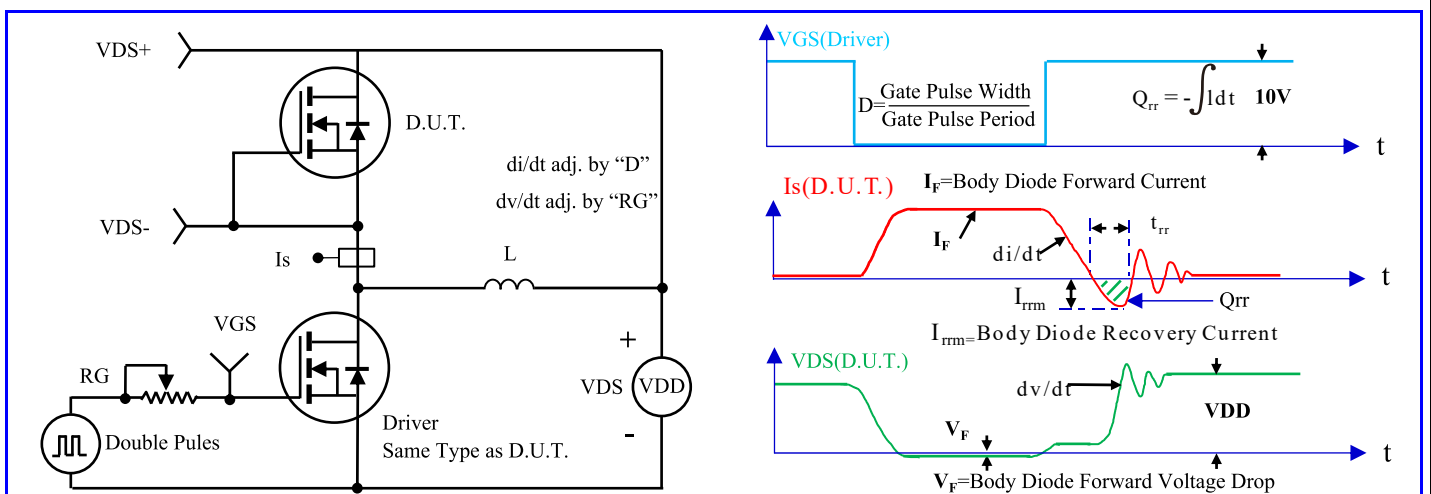


Fig.17- Diode Recovery Test Circuit & Waveform

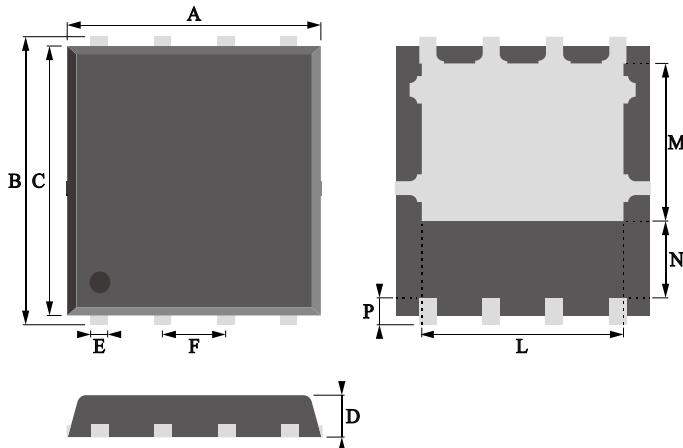
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OUTLINE DRAWINGS

PDFN5*6

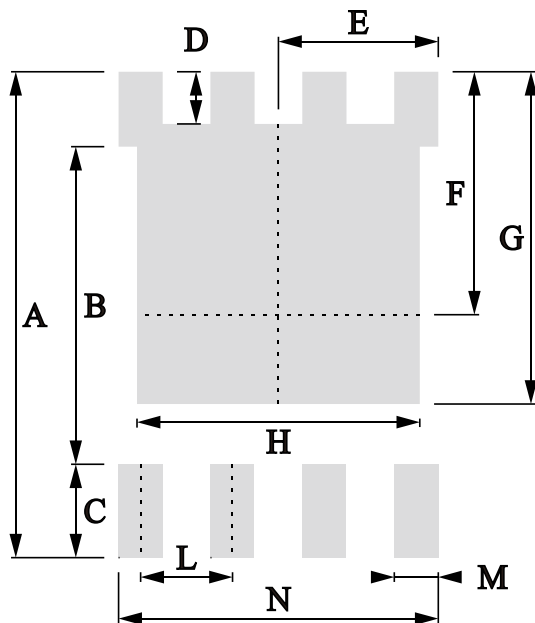


OUTLINE DIMENSIONS

Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.70	-	5.70	0.1850	-	0.2244
B	5.60	-	6.60	0.2205	-	0.2598
C	5.10	-	6.10	0.2008	-	0.2402
D	0.70	-	1.20	0.0276	-	0.0472
E	0.15	-	0.45	0.0059	-	0.0177
F	1.30	-	1.90	0.0512	-	0.0748
M	3.10	-	3.90	0.1220	-	0.1535
L	3.50	-	4.00	0.1378	-	0.1575
N	1.00	-	1.60	0.0394	-	0.0630
P	0.25	-	0.75	0.0098	-	0.0295

RECOMMEDNED LAYOUT DRAWINGS

PDFN5*6



OUTLINE DIMENSIONS

Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	6.61	-	-	0.2602	-
B	-	4.32	-	-	0.1701	-
C	-	1.27	-	-	0.0500	-
D	-	0.71	-	-	0.0280	-
E	-	2.21	-	-	0.0870	-
F	-	3.31	-	-	0.1301	-
G	-	4.52	-	-	0.1780	-
H	-	3.91	-	-	0.1539	-
L	-	1.27	-	-	0.0500	-
M	-	0.61	-	-	0.0240	-
N	-	4.42	-	-	0.1740	-

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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=Internal Code,According To Actual Changes
NSH024N06P5=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)
PDFN5*6	P1	0.087	13" Reel	5000	10000	50000

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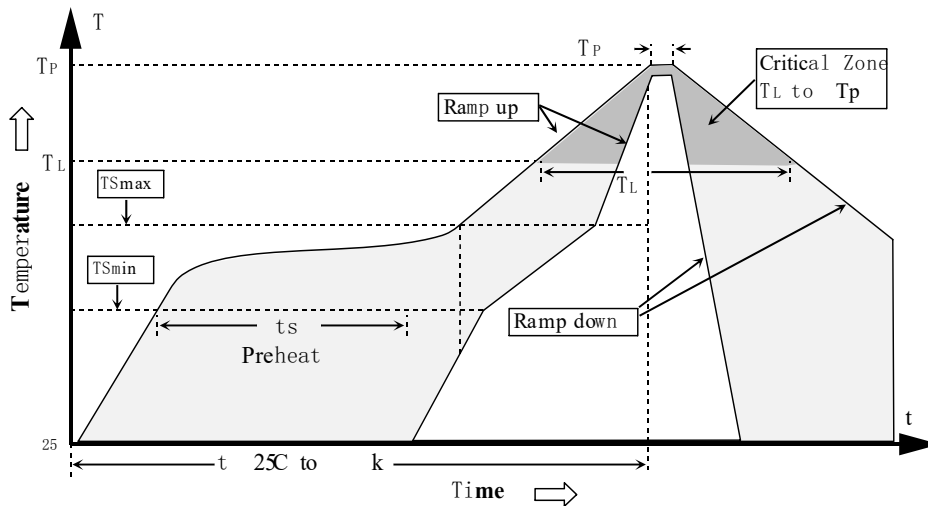
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Recommended wave soldering condition

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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