NPS5N50C

N-Channel Enhancement Mode Power MOSFET

Pb-Free RoHS COMPLIANT

Voltage:	500 Volts	Current:	7.0 Ampers	Package:	TO-220C

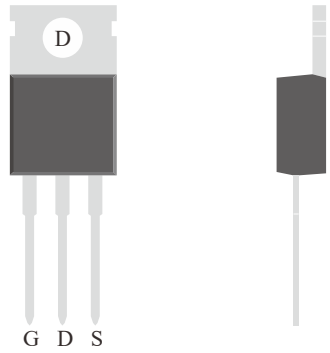
Features

- NH'S Advanced Planar DMOS Technology
- Low Rds(on) For Low On-State Loss
- High EAS For High Reliability
- Qualified According To JEDEC Criteria

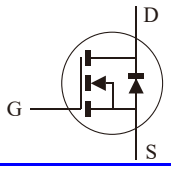
Typical Applications

- AC/DC Converter
- Adaptor And Charger
- PC Power
- LED Drives And LED Lighting

Diagram:



Polarity:



Product Summary

VDS Min.@T_j	500	V
I_D Min.@Ta	7.0	A
RDS(ON)(TYP)@10V	1.30	Ω

***100% UIS TESTED**

***100% ΔVDS TESTED**

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

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current (Note 1)	Ta= 25 ℃ Ta= 100 ℃	I_D	7.0 4.5	A
Drain Current-Pulse (Note 1)	T_J< 150 ℃	I_{DM}	28	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	Ta= 25 ℃ Ta= 100 ℃	P_D	75 30	W
Derating Factor		D_F	0.60	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 10.0 mH	I_{AS}	7.1	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 10.0 mH IAS= 7.1 A,RG= 10.0 Ω Starting Tj=25 ℃,VG = 10.0 V	E_{AS}	252	mJ

Thermal Characteristcs (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℃	$R_{\theta JA}$	62.5	℃/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 75mm x 45mm x 2.5mm Alu. Heat.	$R_{\theta JC}$	1.67	

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

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Electrical Characteristcs (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Static Off Characteristics						
Drain-Source Breakdown Voltage	VGS=0V,ID=250uA	BV_{DSS}	500	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	$\Delta BV_{DSS}/\Delta T_J$	--	0.59	--	V/℃
Drain-Source Leakage Current	VDS= 500 V,VGS=0V	I_{DSS}	--	--	1	uA
Gate-Body Leakage Current	VGS= ±30 V,VDS=0V	I_{GSS}	--	--	±100	nA
Forward Transconductance	ID= 3.5 A,VDS= 15 V	gfs	--	15.0	--	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= 3.5 A,VGS= 10.0 V ID= 3.5 A,VGS= 4.5 V	$R_{DS(ON)}$	-- --	1.3 1.7	1.5 2.3	Ω
Dynamic Characteristics						
Input Capacitance	VDS= 50 V	C_{iss}	--	580.0	--	pF
Output Capacitance	VGS= 0 V	C_{oss}	--	60.0	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C_{rss}	--	4.0	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 250 V	$t_{d(on)}$	--	14.0	--	ns
Turn-On Rise Time	VGS= 10.0 V	t_r	--	18.0	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	$t_{d(off)}$	--	32.0	--	ns
Turn-Off Rise Time		t_f	--	11.0	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 250 V	Q_g	--	12.6	--	nC
Gate-Source Charge	VGS= 10.0 V	Q_{gs}	--	3.0	--	nC
Gate-Drain Charge	ID= 3.5 A	Q_{gd}	--	5.0	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I_S	--	--	7.0	A
Max. Pulsed Forward Cuurent		I_{SM}	--	--	28	A
Diode Forward Voltage	ID= 3.5 A,VGS=0V	V_{SD}	--	0.85	1.5	V
Reverse Recovery Time	ID= 3.5 A,di/dt= 100 A/us	t_{rr}	--	328.0	--	ns
Reverse Recovery Charge	VGS= 10.0 V,VDD= 250 V	Q_{rr}	--	1550.0	--	nC

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Typical Characteristics Curves

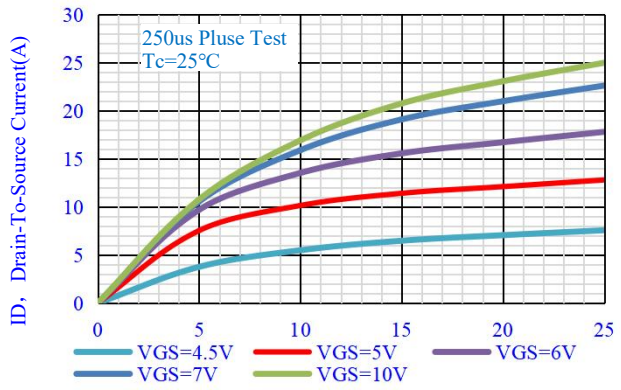

Fig.1-Output Characteritsics

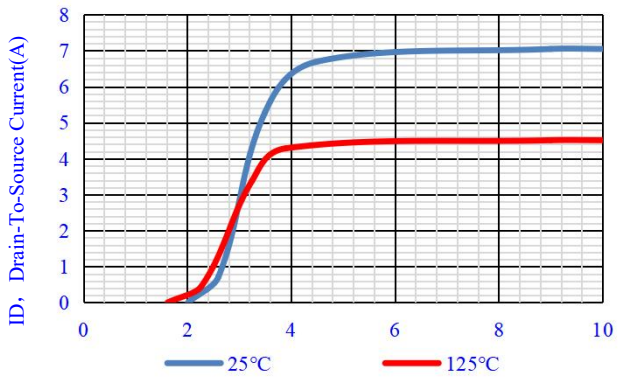

Fig.2- Transfer Characteritsics

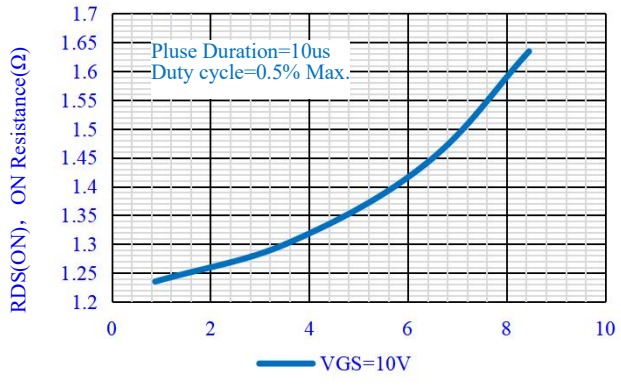

Fig.3- On Resistance vs. Drain Current

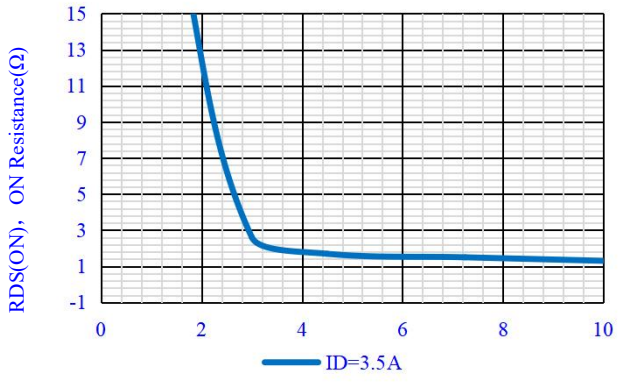

Fig.4- On Resistance vs. Gate Source Voltage

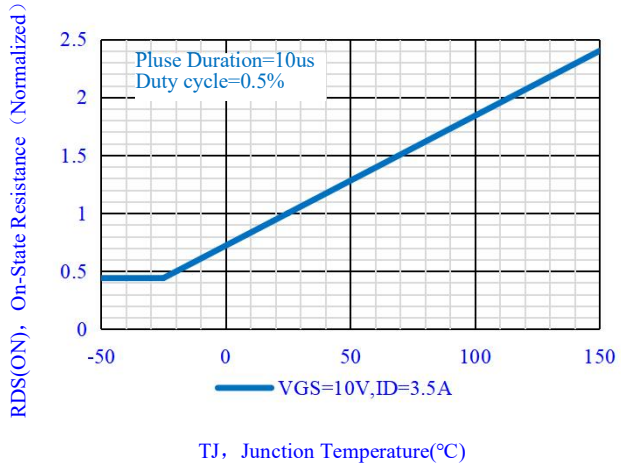

Fig.5-On Resistance vs. Junction Temperature

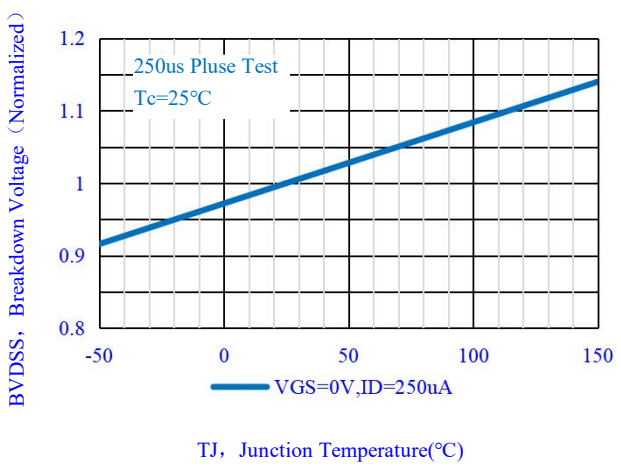

Fig.6- Breakdown Voltage vs. Junction Temperature

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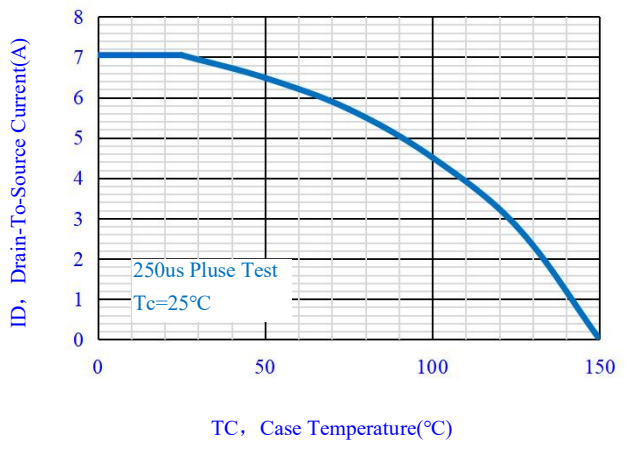

Fig.7-Maximum Continuous Drain Current vs. Case Temperature

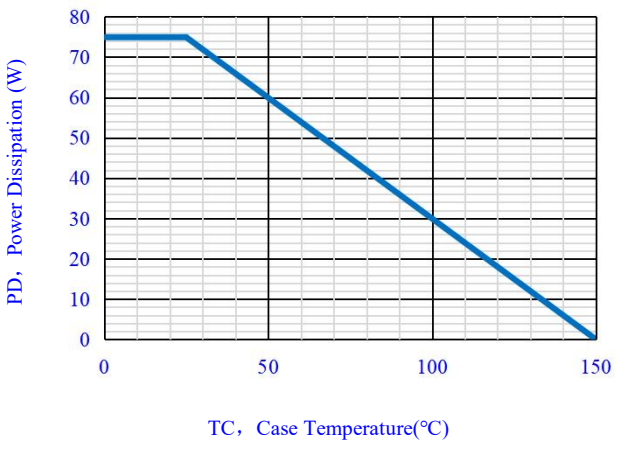

Fig.8-Maximum Power Dissipation vs. Case Temperature

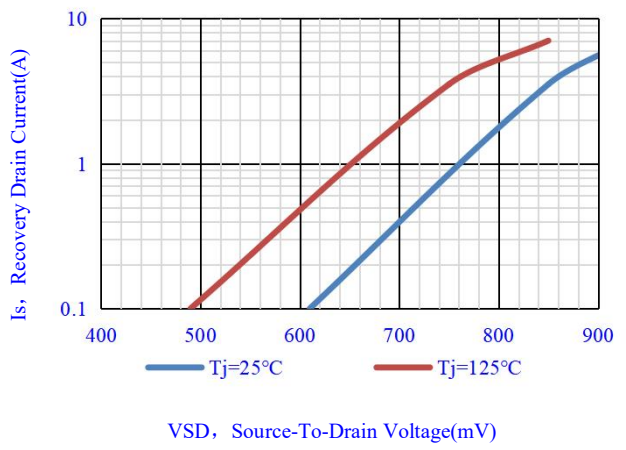

Fig.9- Source-To-Drain Diode Forward Voltage

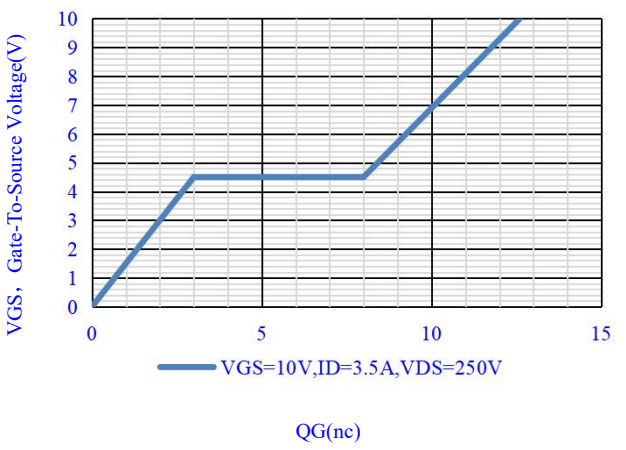

Fig.10-Gate Charge Waveform

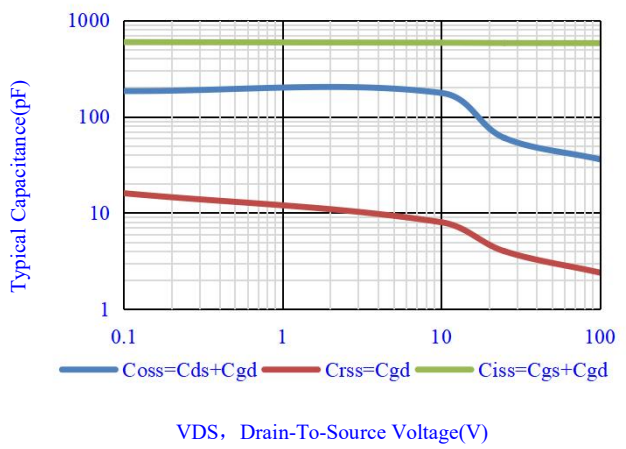

Fig.11-Typical Capacitance vs. Drain-To-Source Voltage

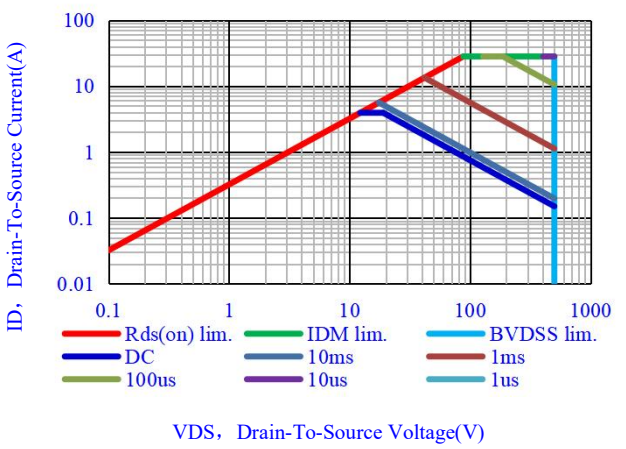

Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

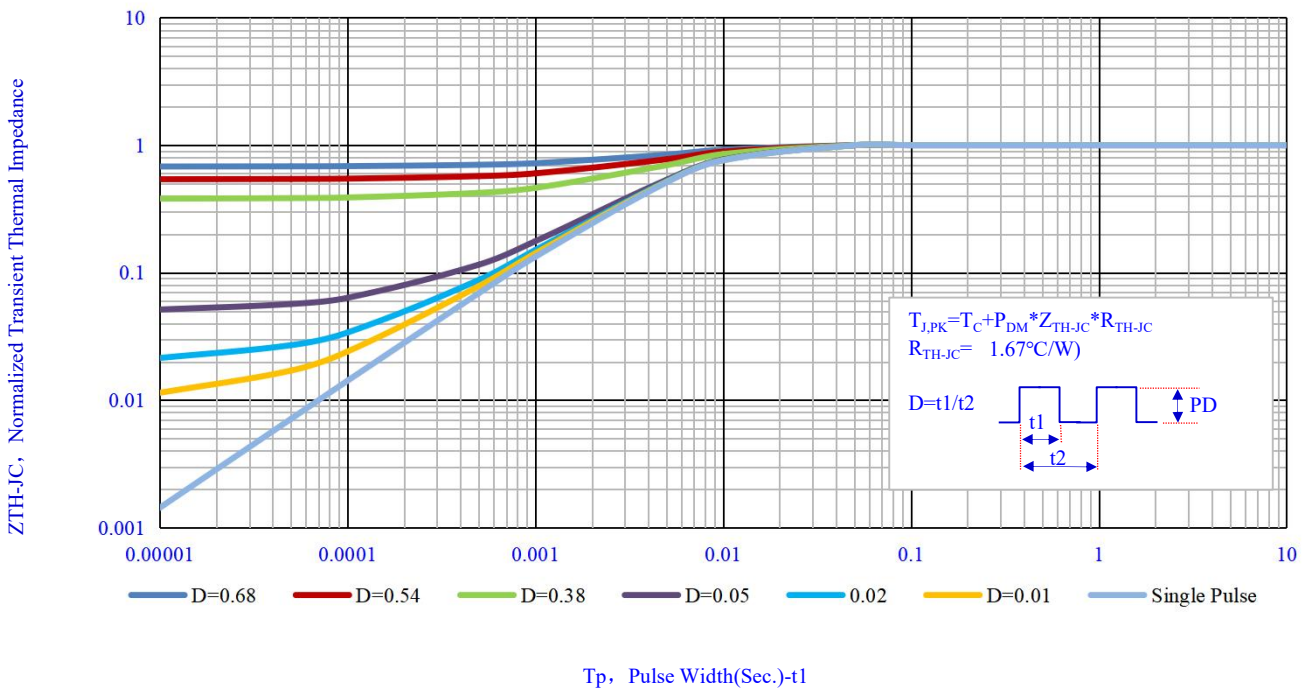

Fig.13- Normalized Maximum Transient Thermal Impedance vs.Pulse Width

Test Circuit & Waveform

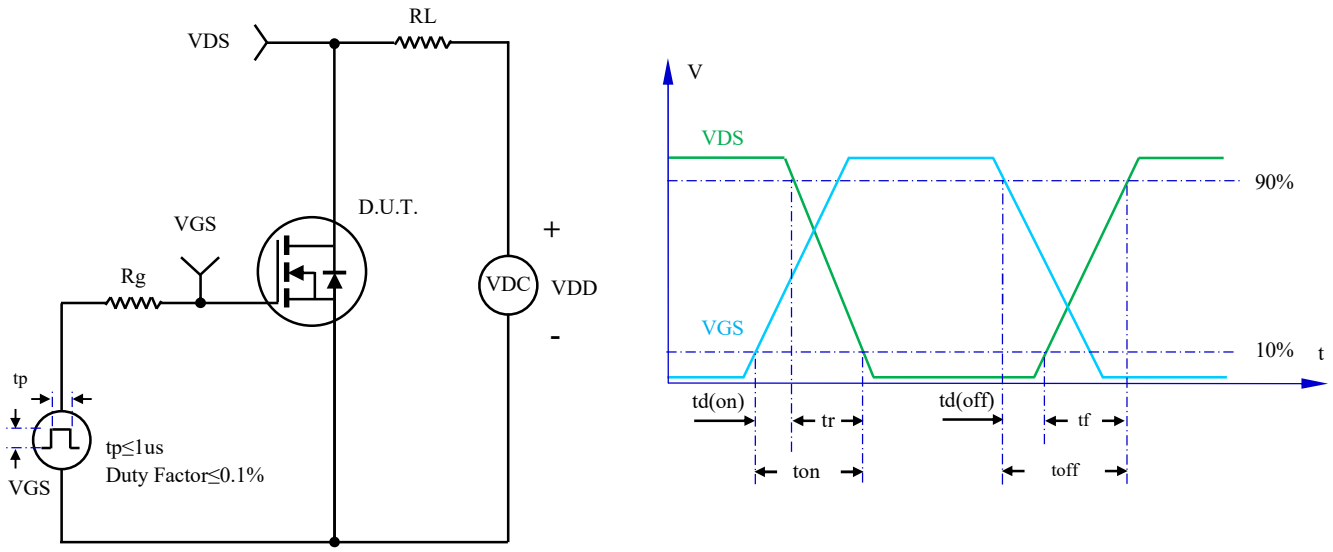

Fig.14- Resistive Switching Test Circuit & Waveform

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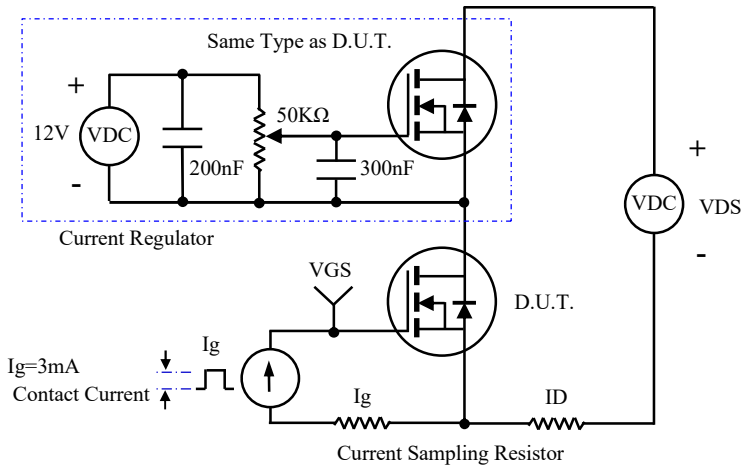
Test Circuit & Waveform



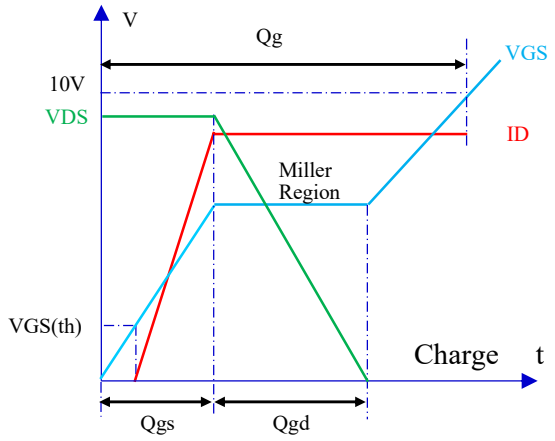
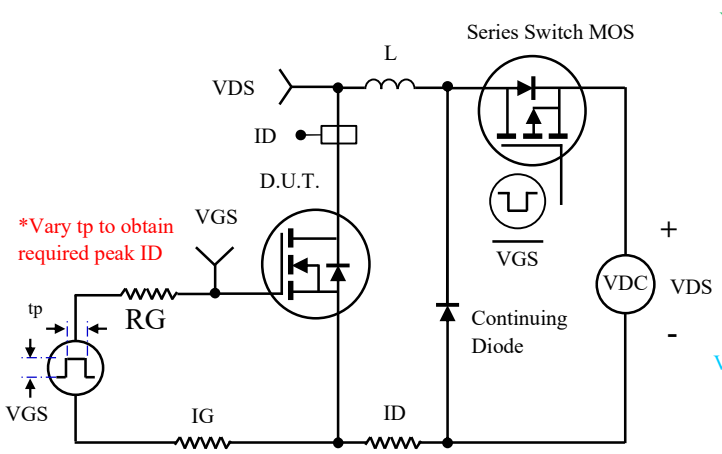


Fig.15-Gate Charge Test Circuit & Waveform



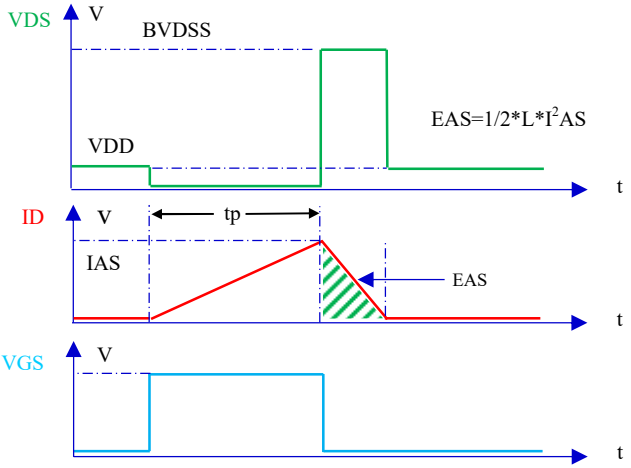
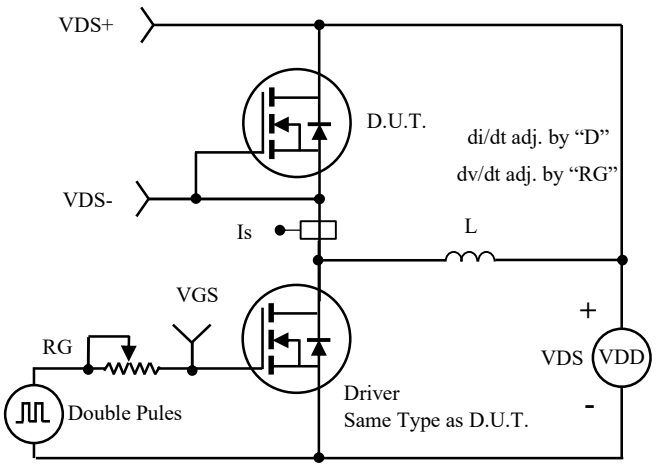


Fig.16- Unclamped Inductive Switching (UIS) Test Circuit & Waveform



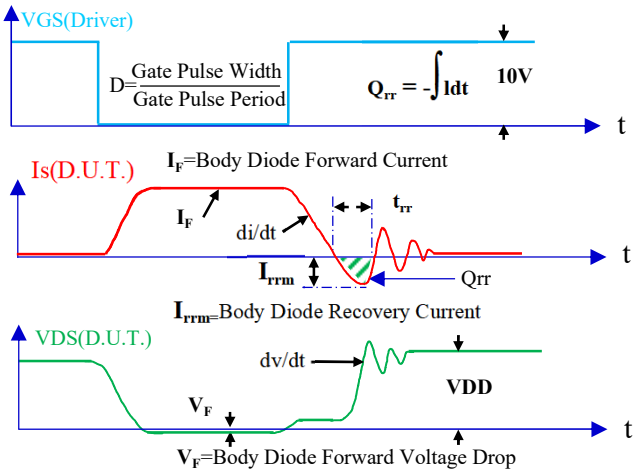


Fig.17- Diode Recovery Test Circuit & Waveform

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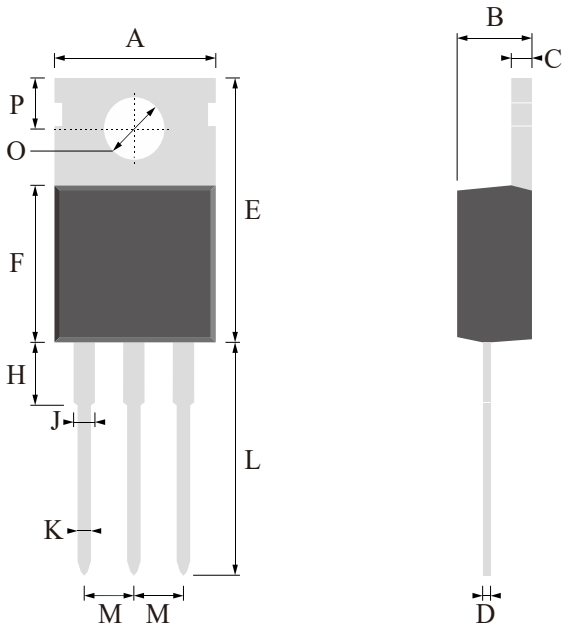
OUTLINE DRAWINGS

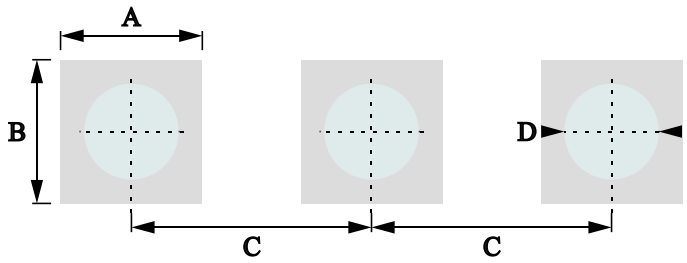
TO-220C



OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.25	-	10.75	0.3642	-	0.4232
B	1.10	-	1.65	0.0433	-	0.0650
C	4.15	-	4.95	0.1634	-	0.1949
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

RECOMMEDNED LAYOUT DRAWINGS

TO-220C



OUTLINE DIMENSIONS						
Dim.	Milimeters			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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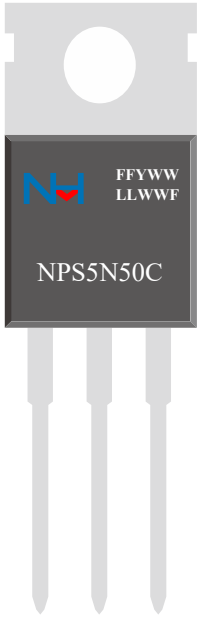
MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhang Trademark

FF=Product Line Code,According To Actual Changes

YWW=Date Code,According To Actual Changes

LLWWF=Inernal Code,According To Actual Changes

NPS5N50C=Model

PACKING INFORMATION

Package Type	Package Code	Productor 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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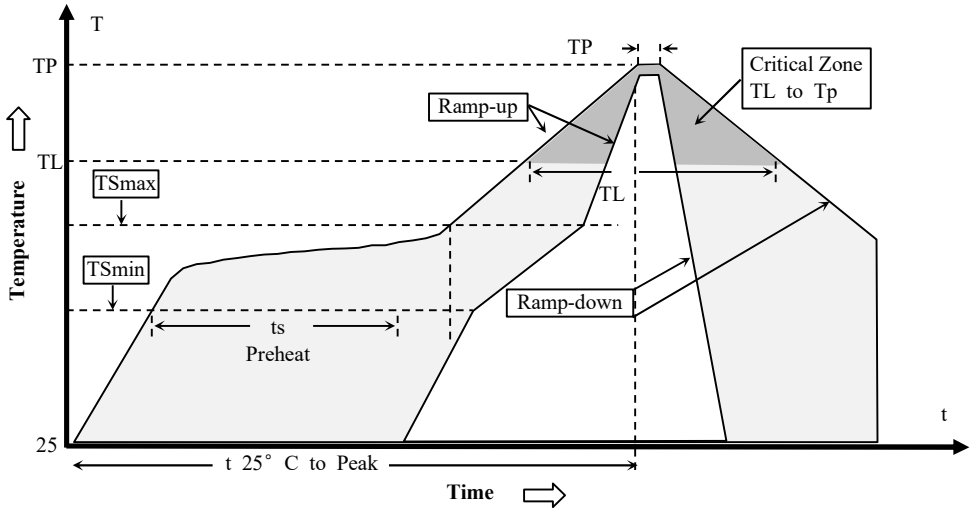
Recommended wave soldering condition

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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