

NH2305A



P-Channel Enhancement Mode Trench Power MOSFET

Voltage: -20 Volts

Current: -4.1 Ampers

Package: SOT-23

Features

- NH'S Advanced Trench Technology
- Low $R_{ds(on)}$ For Low On-State Loss
- High EAS For High Reliability
- Excellent $Q_g \cdot R_{ds(on)}$ Product(FOM)

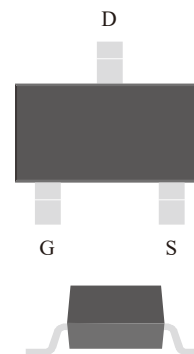
Typical Applications

- DC-DC Converter
- Battery Management System(BMS)
- Printed Circuit Board For Control Circuit
- Uninterruptible Power Supplies(UPS)

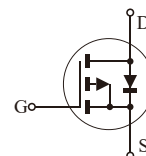
Product Summary

VDS Min.@T _j	-20	V
I _D Min.@Ta	-4.1	A
RDS(ON)(TYP)@-4.5V	35	mΩ

Diagram:



Polarity:



***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}	-20	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 ℃	I _D	-4.1	A
	Ta= 100 ℃		-2.6	
Drain Current-Pulse (Note 1)	T _j < 150 ℃	I _{DM}	-16	A
Maximum Power Dissipation Power Dissipation Derating Factor Above 25℃	Ta= 25 ℃	P _D	1.7	W
	Ta= 100 ℃		1	
Derating Factor		D _F	0.01	W/℃

Thermal Characteristics (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 _{θJA}	357	℃/W

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

NH2305A

P-Channel Enhancement Mode 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}	-20	--	--	V
Bvdss Temperature Coefficient	ID=-250uA,Reference25℃	ΔBV _{DSS} /ΔT _J	--	0.02	--	V/℃
Drain-Source Leakage Current	VDS= -16 V,VGS=0V	I _{DSS}	--	--	-1	uA
Gate-Body Leakage Current	VGS= ±12 V,VDS=0V	I _{GSS}	--	--	±100	nA
Static On Characteristics						
Gate Threshold Voltage	VGS= VDS ID=-250uA	V _{GS(TH)}	-0.45	-0.7	-1	V
Drain-Source On Resistance	ID= -2.1 A,VGS= -4.5 V	R _{DS(ON)}	--	35	46	mΩ
	ID= -2.1 A,VGS= -2.5 V		--	45.5	64.4	
Dynamic Characteristics						
Input Capacitance	VDS= -10 V	C _{iss}	--	950	--	pF
Output Capacitance	VGS= 0 V	C _{oss}	--	130	--	pF
Reverse Transfer Capacitance	F= 1 MHZ	C _{rss}	--	100	--	pF
Forward Transconductance	ID= -2.1 A,VDS= -5 V	g _{fs}	--	6.0	--	S
Switching Paramters (Test Circuit & Waveform See Fig.15)						
Turn-On Delay Time	VDS= -10 V	t _{d(on)}	--	12	--	ns
Turn-On Rise Time	VGS= -4.5 V	t _r	--	35	--	ns
Turn-Off Delay Time	RG= 10.0 Ω	t _{d(off)}	--	30	--	ns
Turn-Off Rise Time		t _f	--	10	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.16)						
Total Gate Charge	VDS= -10 V	Q _g	--	7.8	--	nC
Gate-Source Charge	VGS= -4.5 V	Q _{gs}	--	1.2	--	nC
Gate-Drain Charge	ID= -2.1 A	Q _{gd}	--	1.6	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.18)						
Max. Diode Forward Cuurent		I _S	--	--	-4.1	A
Max. Pulsed Forward Cuurent		I _{SM}	--	--	-16	A
Diode Forward Voltage	ID= -2.1 A,VGS=0V	V _{SD}	--	-0.8	-1.2	V

P-Channel Enhancement Mode Trench Power MOSFET

Typical Characteristics Curves

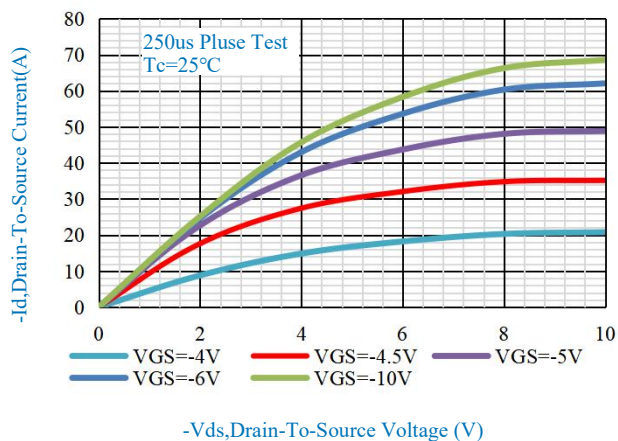


Fig.1-Output Characteristics

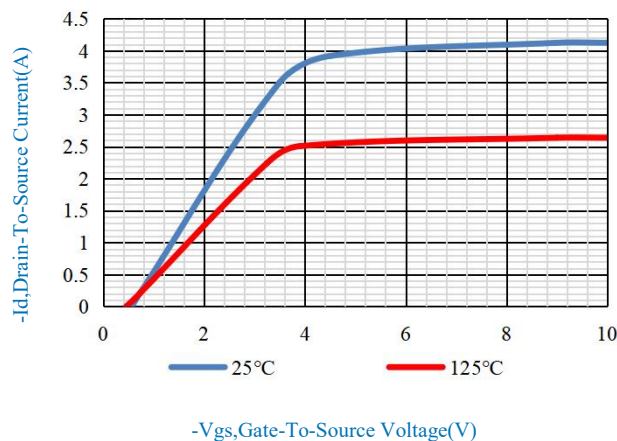


Fig.2-Transfer Characteristics

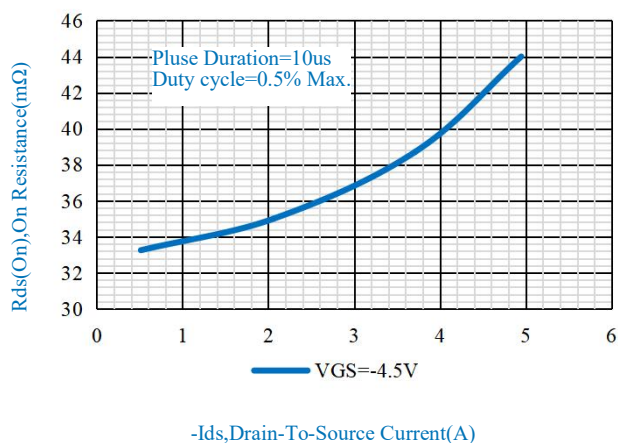


Fig.3-On Resistance Vs. Drain Current

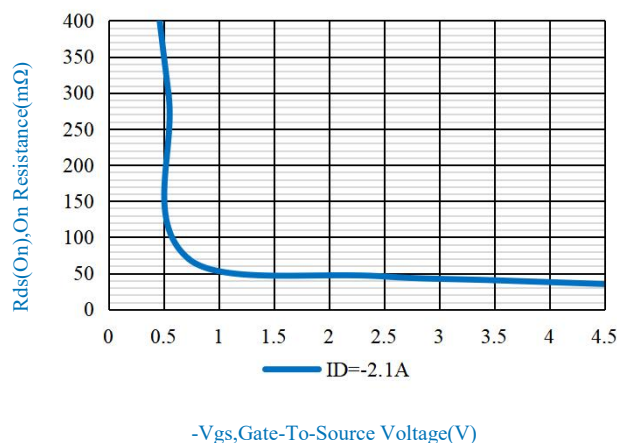


Fig.4-On Resistance Vs. Gate Source Voltage

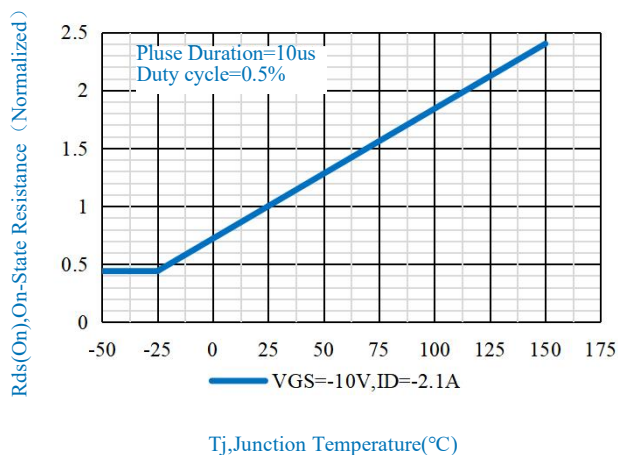


Fig.5-On Resistance Vs. Junction Temperature

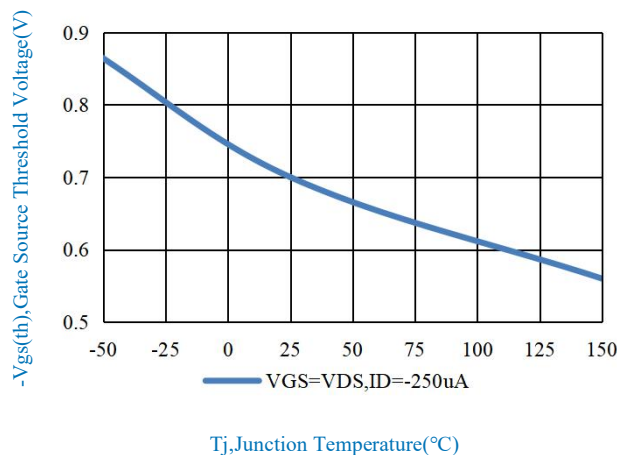


Fig.6-Gate Source Threshold Voltage Vs. Junction Temperature

NH2305A



P-Channel Enhancement Mode Trench Power MOSFET

Typical Characteristics Curves

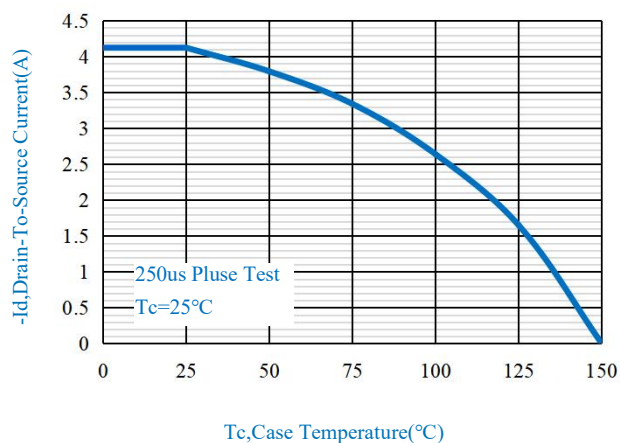


Fig.7-Maximum Continuous Drain Current Vs. Case Temperature

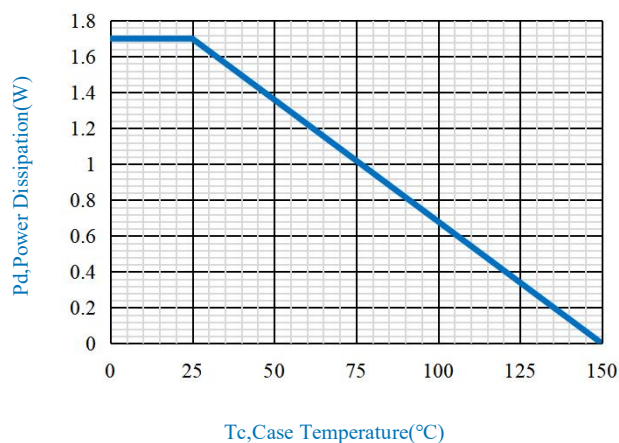


Fig.8-Maximum Power Dissipation Vs. Case Temperature

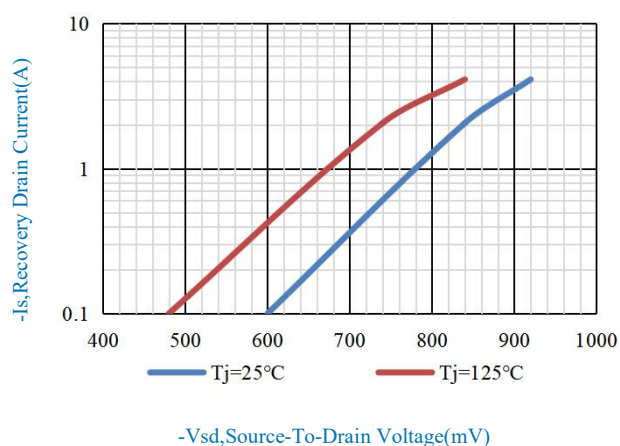


Fig.9-Source-To-Drain Diode Forward Voltage

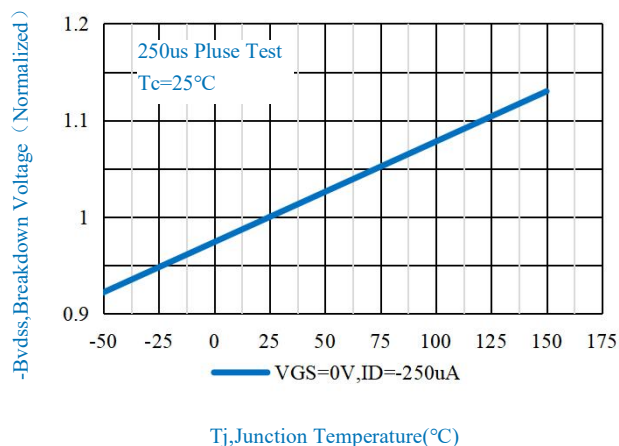


Fig.10-Breakdown Voltage Vs. Junction Temperature

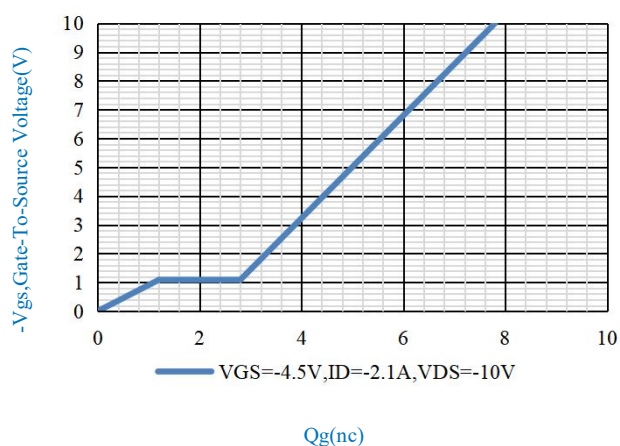


Fig.11-Gate Charge Waveform

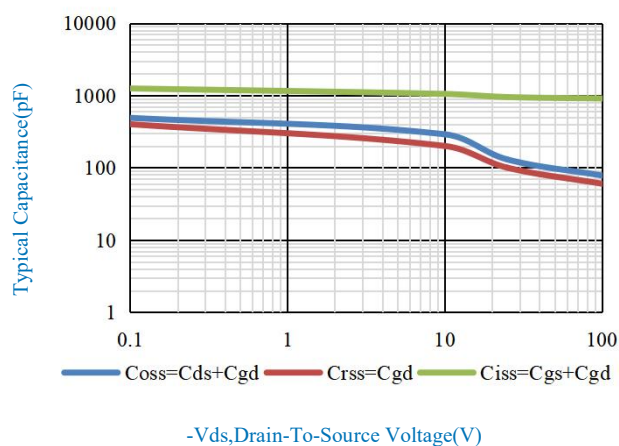


Fig.12-Typical Capacitance Vs. Drain-To-Source Voltage

NH2305A



P-Channel Enhancement Mode Trench Power MOSFET

Typical Characteristics Curves

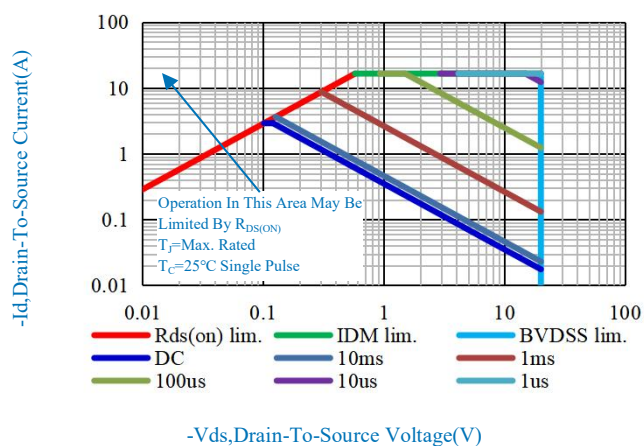


Fig.13-Maximum Safe Operating Area(SOA)

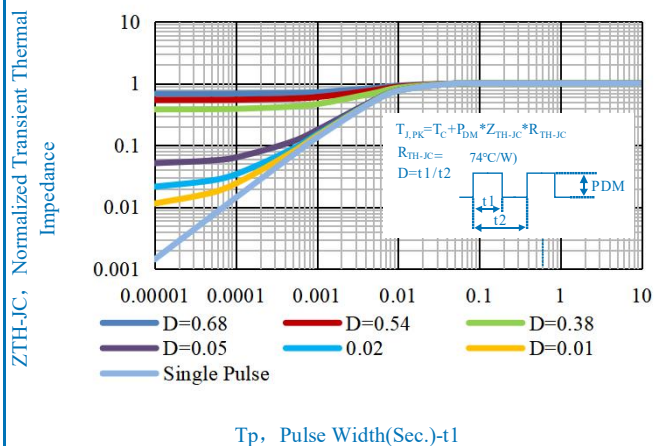


Fig.14- Normalized Maximum Transient Thermal Impedance Vs. Pulse Width

Test Circuit & Waveform

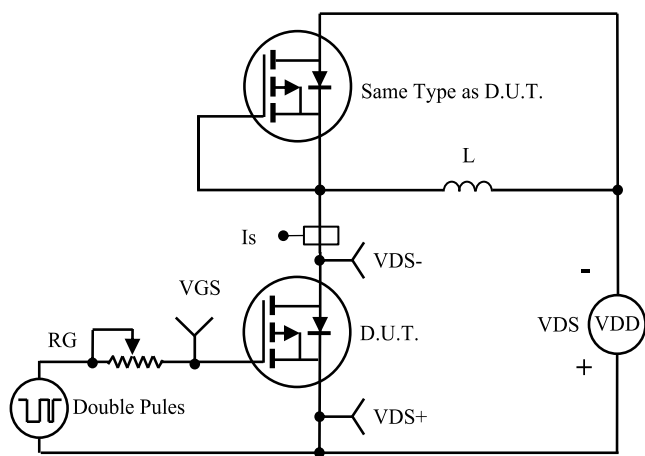


Fig.15- Resistive Switching Test Circuit & Waveform

P-Channel Enhancement Mode Trench Power MOSFET

Test Circuit & Waveform

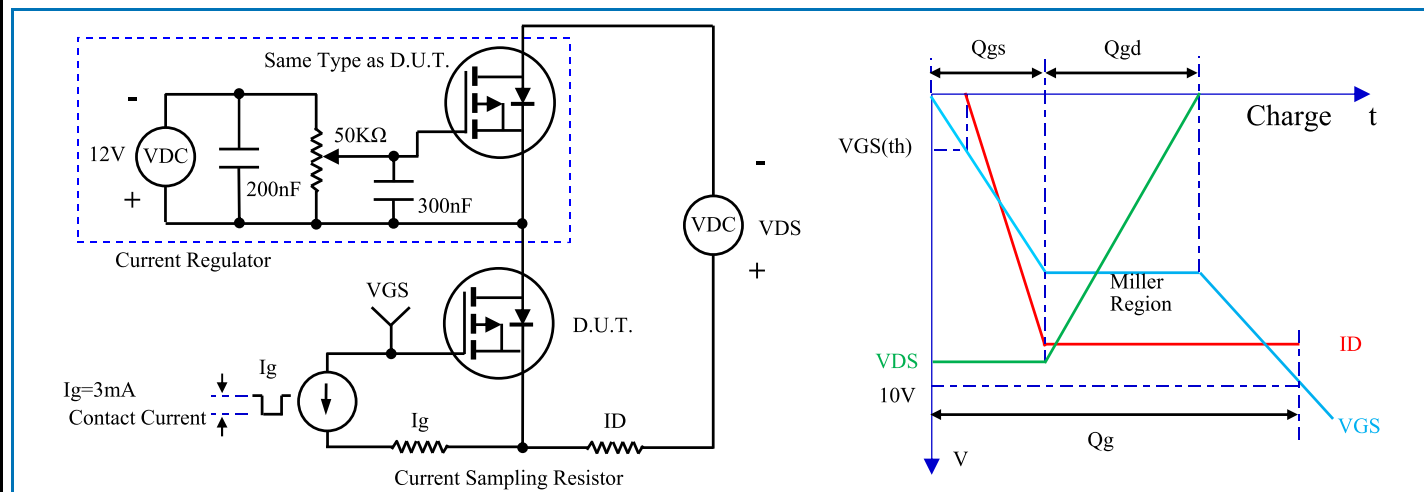


Fig.16-Gate Charge Test Circuit & Waveform

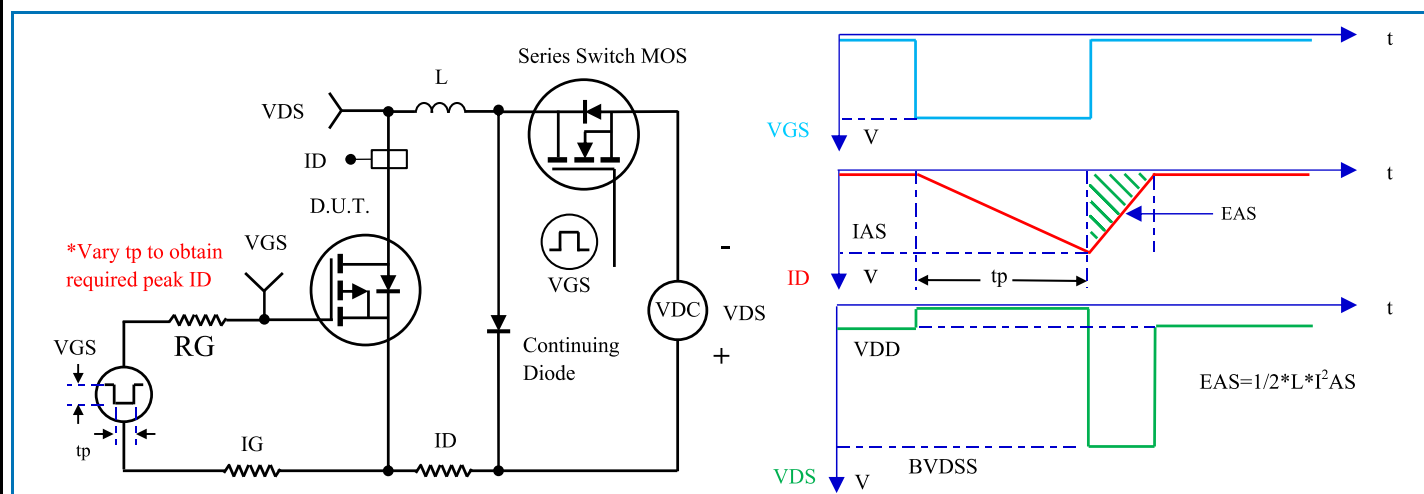


Fig.17- Unclamped Inductive Switching (UIS) Test Circuit & Waveform

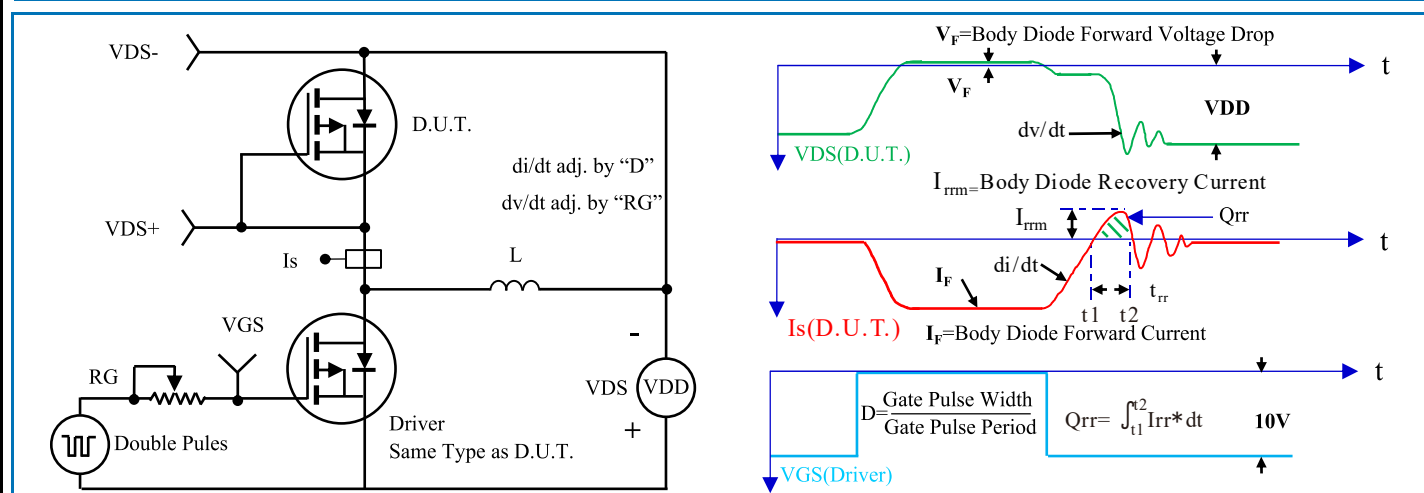


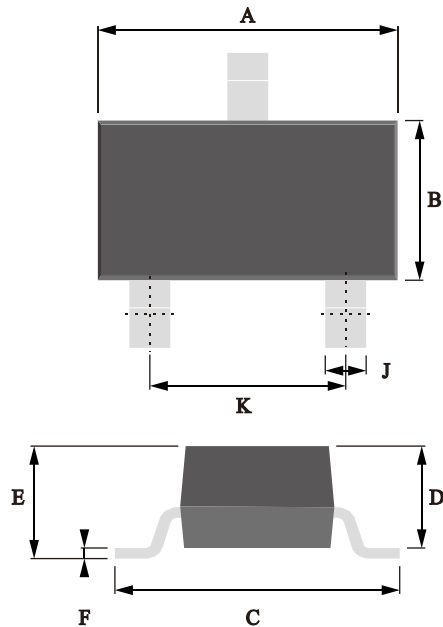
Fig.18- Diode Recovery Test Circuit & Waveform

NH2305A



P-Channel Enhancement Mode Trench Power MOSFET

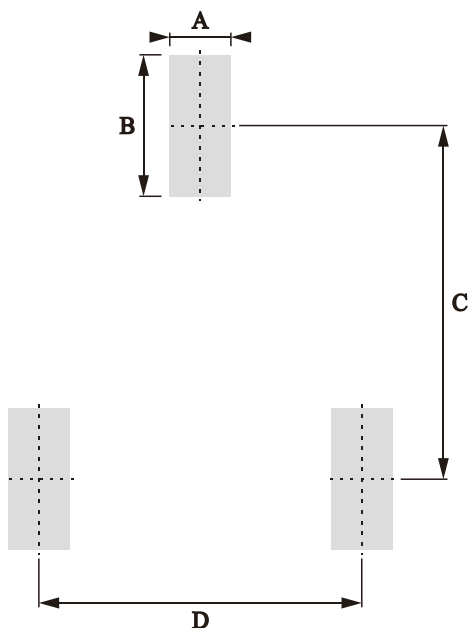
OUTLINE DRAWINGS



SOT-23

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.80	-	3.20	0.1102	-	0.1260
B	1.15	-	1.45	0.0453	-	0.0571
C	2.25	-	2.65	0.0886	-	0.1043
D	0.85	-	1.15	0.0335	-	0.0453
E	0.90	-	1.20	0.0354	-	0.0472
F	0.08	-	0.18	0.0031	-	0.0071
J	0.30	-	0.50	0.0118	-	0.0197
K	1.70	-	2.10	0.0669	-	0.0827

RECOMMENDED LAYOUT DRAWINGS



SOT-23

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.60	-	-	0.0000	-
B	-	0.80	-	-	0.0315	-
C	-	2.00	-	-	0.0787	-
D	-	1.90	-	-	0.0748	-

NH2305A

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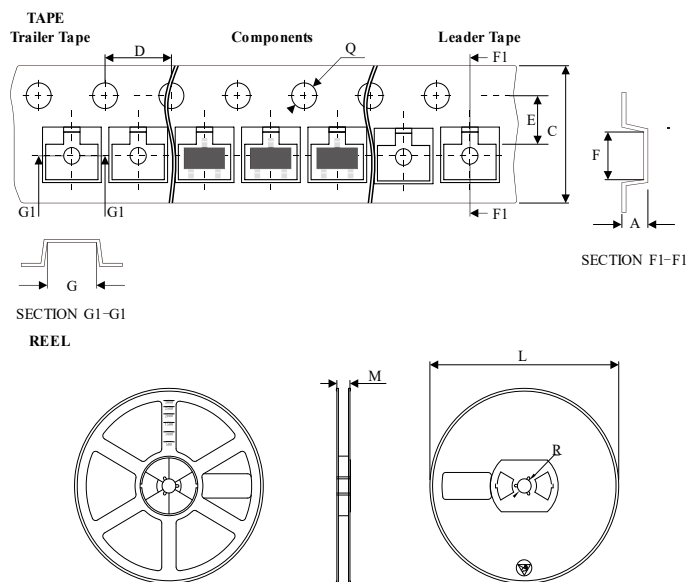
MARKING INFORMATION



MARKING INSTRUCTIONS

P5A=Mark

PACKAGING



SOT-23

OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
TAPE						
A	1.12	-	1.32	0.0441	-	0.0520
C	7.90	-	8.10	0.3110	-	0.3189
D	3.70	-	4.30	0.1457	-	0.1693
E	3.40	-	3.60	0.1339	-	0.1417
F	2.67	-	2.87	0.1051	-	0.1130
G	3.05	-	3.25	0.1201	-	0.1280
Q Φ	1.40	-	1.60	0.0551	-	0.0630
REEL						
L Φ	176.00	-	180.00	6.929	-	7.087
R	12.00	-	14.00	0.4724	-	0.5512
M	11.00	-	13.00	0.4331	-	0.5118

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
SOT-23	P1	0.008	7" Reel	3000	45000	180000

NH2305A



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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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NH2305A

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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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