NCH80R1K4S

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Voltage:	800	Volts	Current:	4.2	Amperes	Package:	TO-252

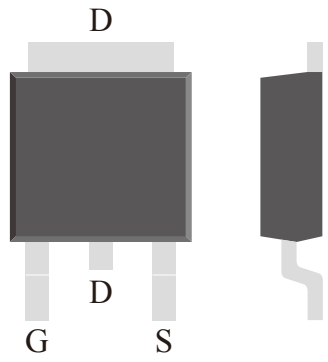
Features

- NH'S Advanced Silicon Carbide MOSFET Technology
- High Blocking Voltage And Low Capacitances
- High-Speed Switching For Very Low Switching Losses
- Excellent Qg*Rds(on) Product(FOM）

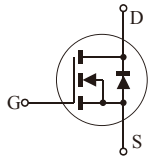
Typical Applications

- High Voltage DC/DC Converters
- Adaptor And Charger
- Battery Chargers And Motor Drives
- LED Drives And LED Lighting

Diagram:



Polarity:



Product Summary

VDS Min.@T_j	800	**V**
I_D Min.@Ta	4.2	**A**
RDS(ON)(TYP)@18V,Tj=25℃	1400	**mΩ**

***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}	800	V
Gate-Source Voltage		$V_{GS\ MAX.}$	-8/+22	V
		$V_{GS\ O.P.}$	-4/+18	
Continuous Drain Current (Note 1)	Ta= 25 ℃	I_D	4.2	A
	Ta= 100 ℃		1.6	
Drain Current-Pulse (Note 1)	T_J< 150 ℃	I_{DM}	7.6	A
Maximum Power Dissipation Power	Ta= 25 ℃	P_D	24.5	W
Dissipation Derating Factor Above 25℃	Ta= 100 ℃		9.8	
Derating Factor		D_F	0.20	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 2.0 mH	I_{AS}	2.5	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.22	L= 2.0 mH IAS= 2.5 A,RG= 10.0 Ω Starting Tj=25 ℃,VG = 18.0 V	E_{AS}	6	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℃	$R_{\theta JA}$	100	℃/W
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	$R_{\theta JC}$	5.1	

Notes: 1.Pulse Width Limited By Max. Junction Temperature. (See Fig. 19).

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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=100uA		BV_{DSS}	800	--	--	V
Zero Gate Voltage Drain Current	VDS= 800 V,VGS=0V,Tj=25℃		I_{DSS}	--	1	50	uA
Gate To Source Leakage Current	VGS= 22.0 V,VDS=0V		I_{GSS}	--	--	100	nA
Source To Gate Leakage Current	VGS= -8.0 V,VDS=0V		I_{SGS}	--	--	100	nA
Forward Transconductance	ID= 1.2 A,VDS= 20 V		gfs	--	0.6	--	S
Static On Characteristics							
Gate Threshold Voltage	VGS= VDS, ID=0.3mA ,Tj=25℃		$V_{GS(TH)}$	2	3.2	4	V
	VGS= VDS, ID=0.3mA ,Tj=150℃			--	2.2	--	
Drain-Source On Resistance	ID= 1.2 A,VGS= 18.0 V,Tj=25℃		$R_{DS(ON)}$	--	1400	1700	mΩ
	ID= 1.2 A,VGS= 18.0 V,Tj=150℃			--	1550	--	
Dynamic Characteristics							
Gate Resistance	VGS=0V,VDS=0V,Freq.=1MHz		R_g	--	9	--	Ω
Input Capacitance	VDS= 400 V		C_{iss}	--	46	--	pF
Output Capacitance	VGS= 0 V		C_{oss}	--	7	--	pF
Reverse Transfer Capacitance	F= 1 MHZ		C_{rss}	--	1	--	pF
Coss Stored Energy			E_{oss}	--	0.6	--	uJ
Switching Paramters (Test Circuit & Waveform See Fig.20)							
Turn-On Delay Time	VDS= 400.0 V	Tj=25℃	$t_{d(on)}$	--	7	--	ns
Turn-On Rise Time	ID= 1.2 A	Tj=25℃	t_r	--	15	--	ns
Turn-Off Delay Time	VGS= -4/+18 V	Tj=25℃	$t_{d(off)}$	--	10	--	ns
Turn-Off Rise Time	RG= 2.5 Ω	Tj=25℃	t_f	--	25	--	ns
Turn−On Switching Loss	L= 200 μH	Tj=25℃	E_{on}	--	4	--	μJ
Turn−Off Switching Loss		Tj=25℃	E_{off}	--	3.3	--	μJ
Total Switiching Energy		Tj=25℃	E_{tot}	--	7.3	--	μJ
Gate Charge Paramters (Test Circuit & Waveform See Fig.21)							
Total Gate Charge	VDS= 400 V		Q_g	--	5	--	nC
Gate-Source Charge	VGS= -4/+18 V		Q_{gs}	--	1.5	--	nC
Gate-Drain Charge	ID= 1.2 A		Q_{gd}	--	2	--	nC

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Electrical Characteristcs (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions		Symbol	Min.	Typ.	Max.	Unit
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.23)							
Max. Diode Forward Current	Tj= 25 ℃		I_S	--	--	4.2	A
tp Limited by T_J(max)	Tj= 100 ℃			--	--	2.7	
Max. Pulsed Forward Current			I_{SM}	--	--	8.4	A
Diode Forward Voltage	ID= 1 A,VGS=-0V	Tj=25℃	V_{SD}	--	4.4	--	V
		Tj=150℃		--	4.1	--	
Reverse Recovery Time	IS= 1.2 A	Tj=25℃	t_{rr}	--	24	--	ns
Reverse Recovery Charge	di/dt= 1000 A/us	Tj=25℃	Q_{rr}	--	12	--	nC
Reverse Recovery Current	VGS= 0.0 V	Tj=25℃	I_{rrm}	--	0.8	--	A
Reverse Recovery Energy	VDS= 400 V	Tj=25℃	E_{rr}	--	3.8	--	µJ

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Typical Characteristics Curves

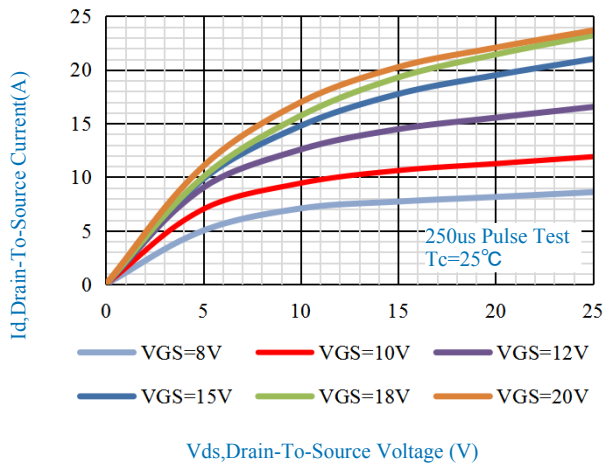


Fig.1-Output Characteristic@Tj=25℃

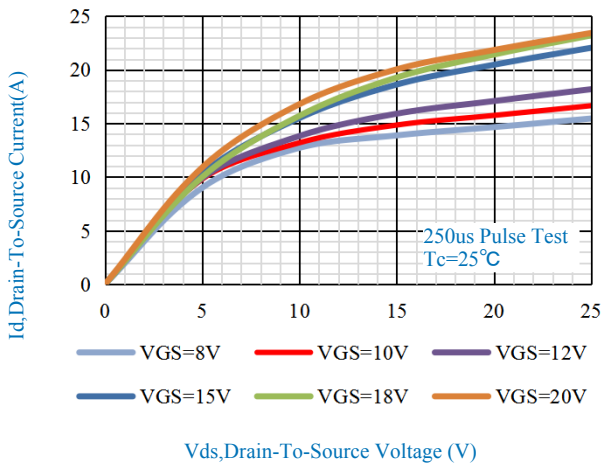


Fig.2-Output Characteristic@Tj=150℃

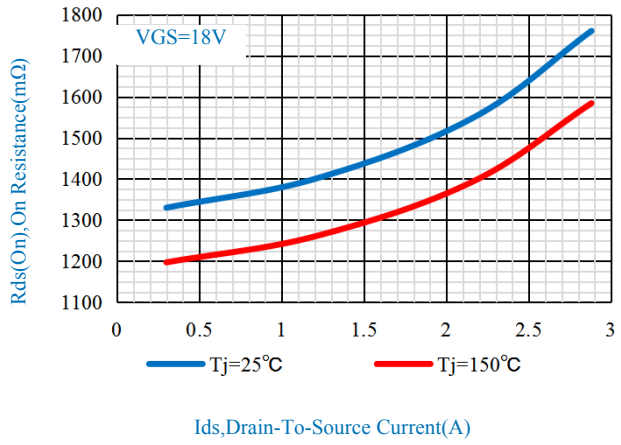


Fig.3-On Resistance Vs. Drain Current

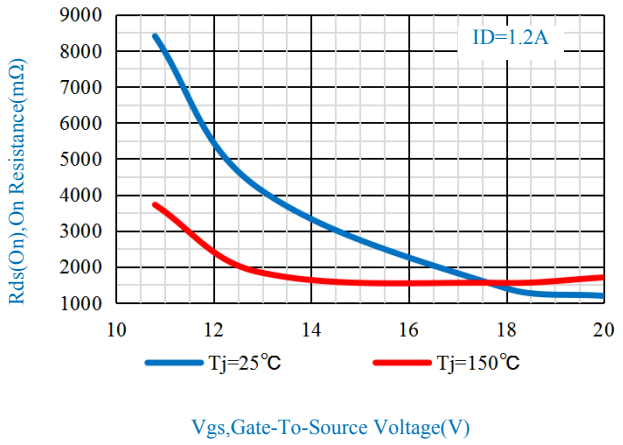


Fig.4-On Resistance Vs. Gate Source Voltage

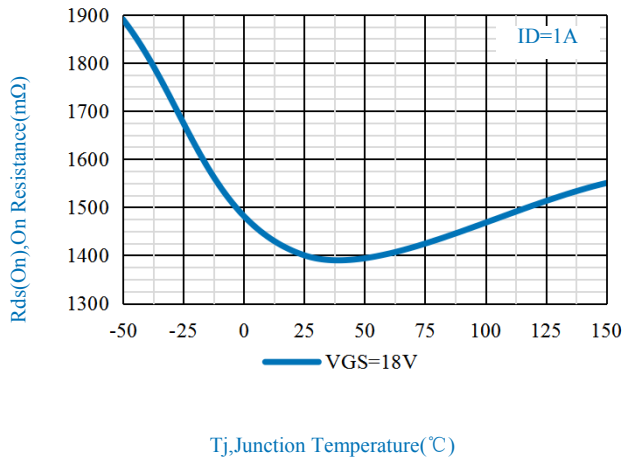


Fig.5-On Resistance Vs. Junction Temperature

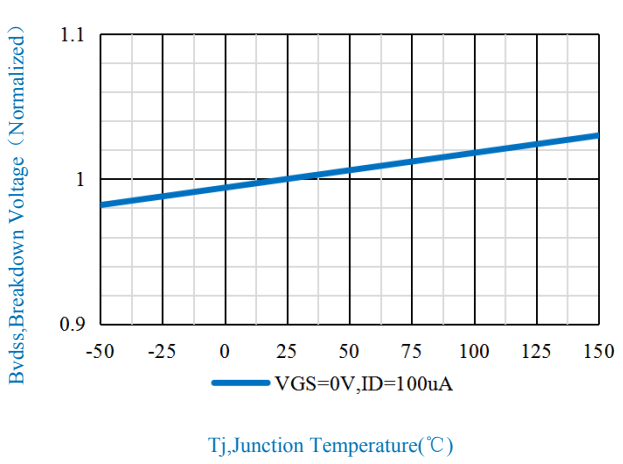


Fig.6-Breakdown Voltage Vs. Junction Temperature

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Typical Characteristics Curves

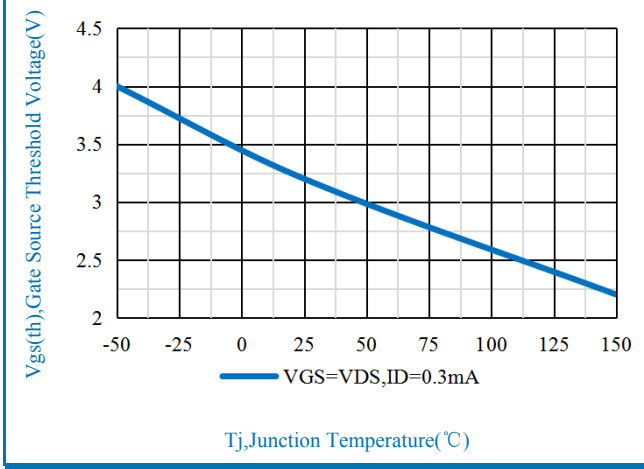


Fig.7-Gate Source Threshold Voltage Vs. Junction Temperature

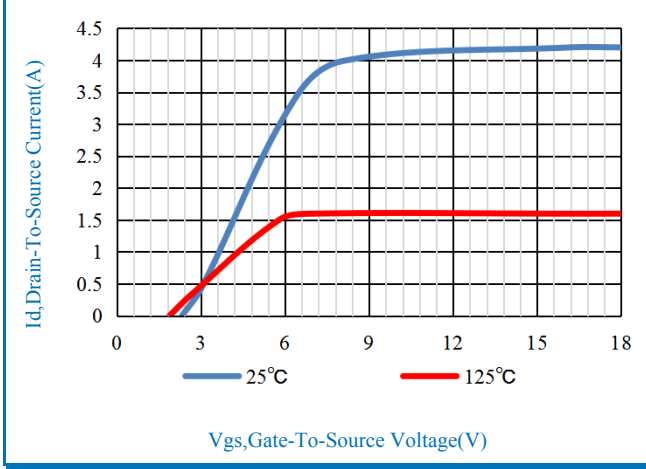


Fig.8-Transfer Characteristic

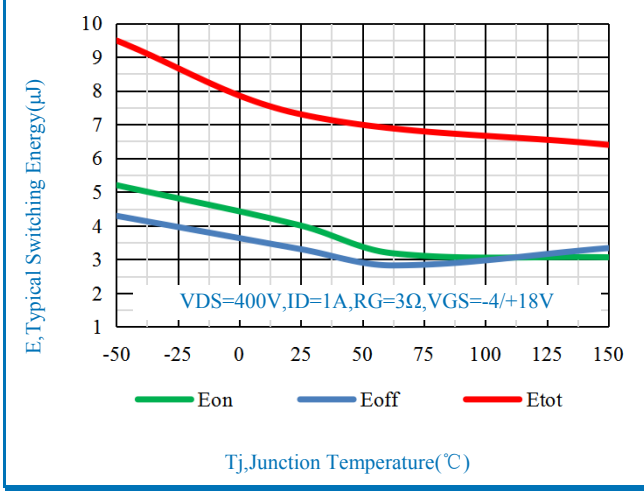


Fig.9-Typical Switching Energy Vs. Junction Temperature

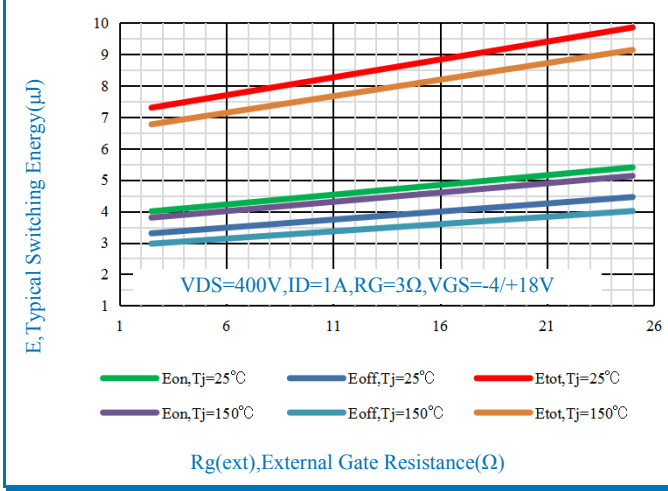


Fig.10-Typical Switching Energy Vs. External Gate Resistance

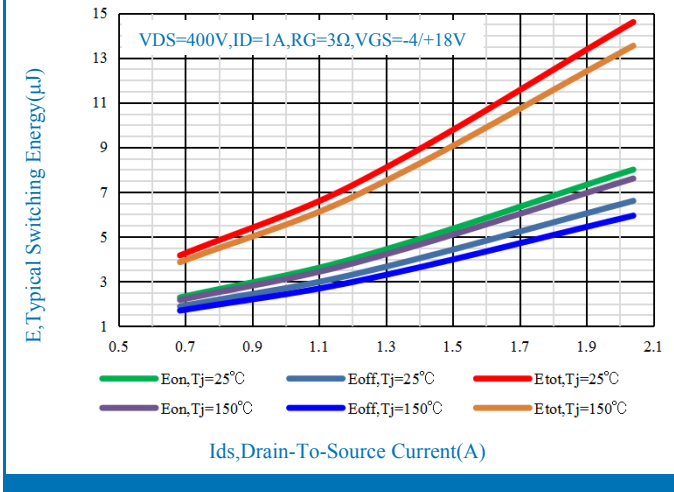


Fig.11-Typical Switching Energy Vs. Drain Source Current

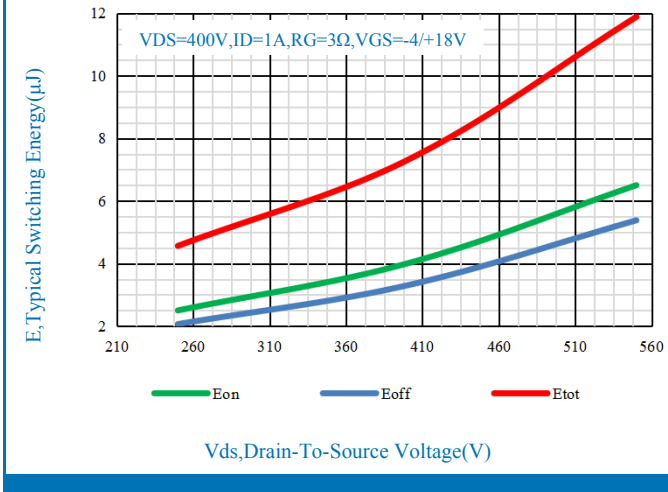


Fig.12-Typical Switching Energy Vs. Drain Source Voltage

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Typical Characteristics Curves

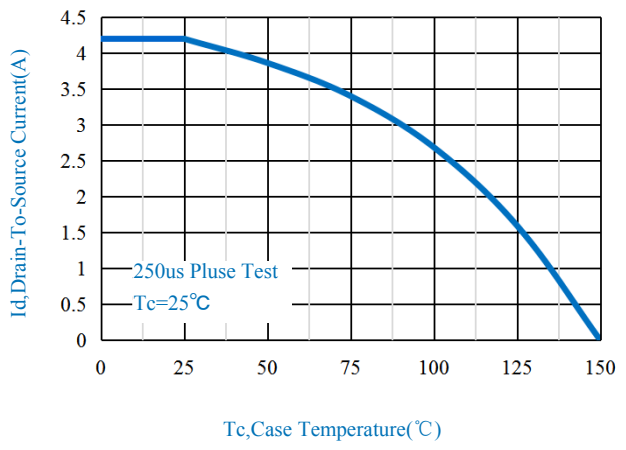


Fig.13-Maximum Continuous Drain Current Vs. Case Temperature

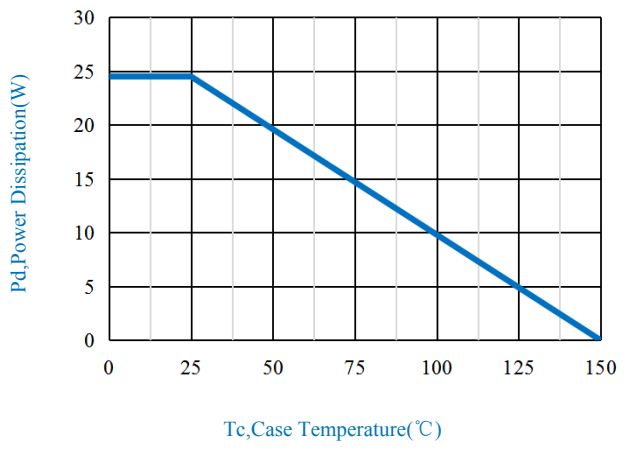


Fig.14-Maximum Power Dissipation Vs. Case Temperature

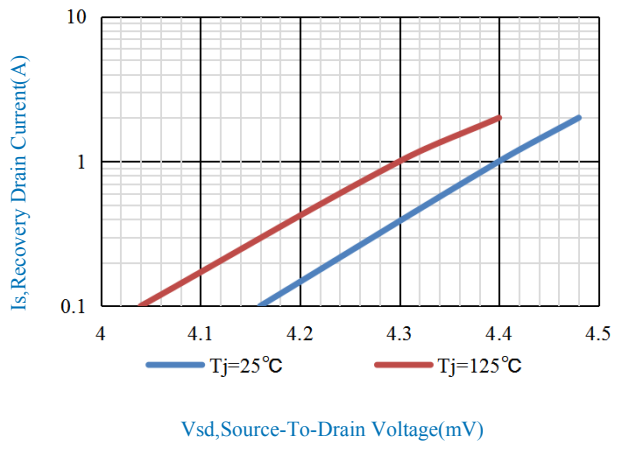


Fig.15-Source-To-Drain Diode Forward Voltage

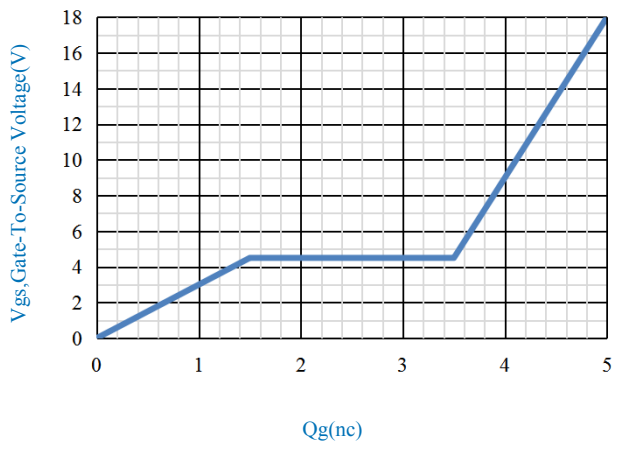


Fig.16-Gate Charge Waveform

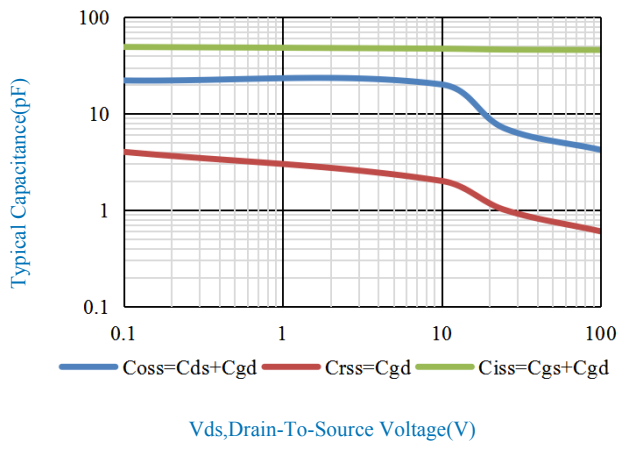


Fig.17-Typical Capacitance Vs. Drain-To-Source Voltage

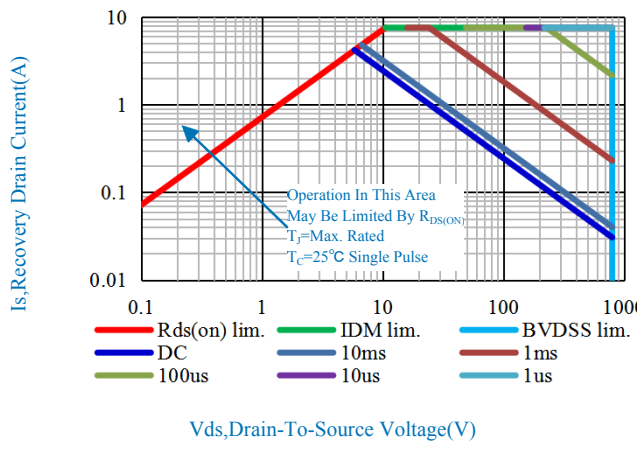


Fig.18-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

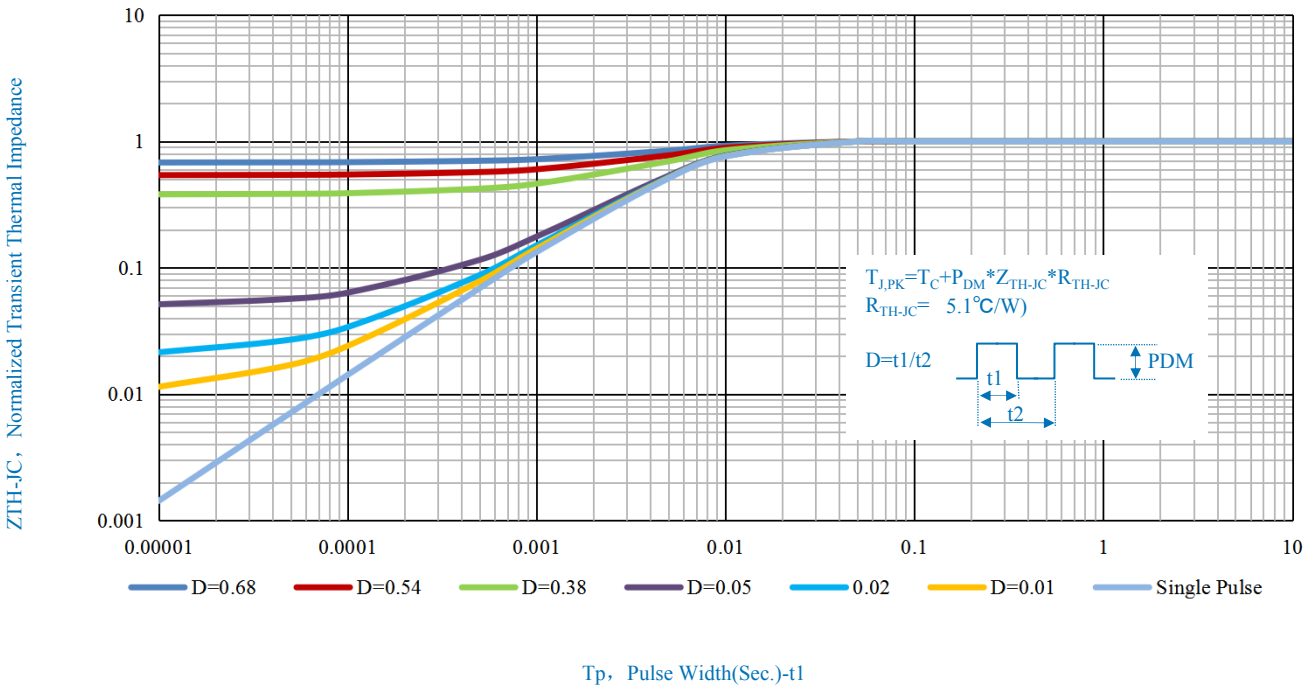


Fig.19- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

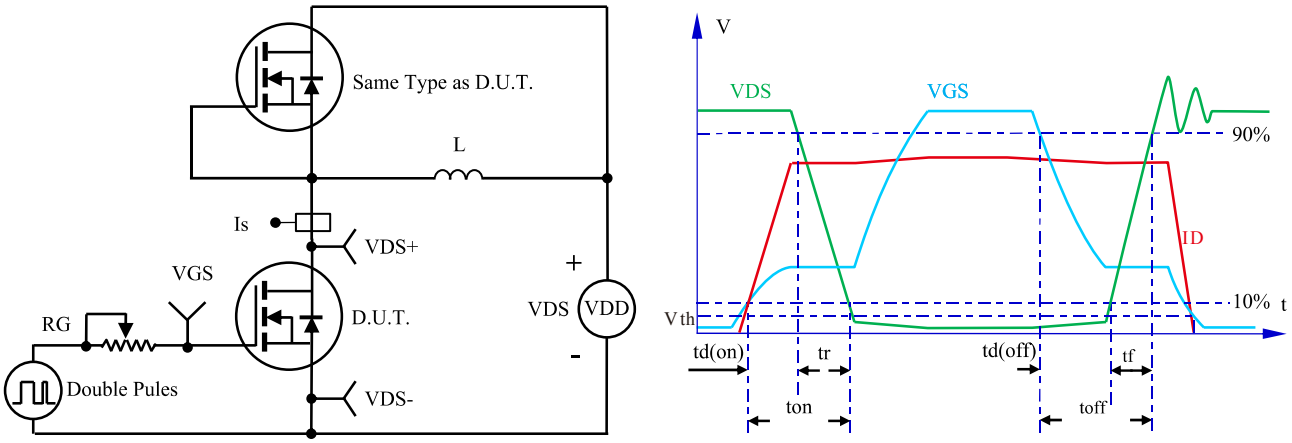


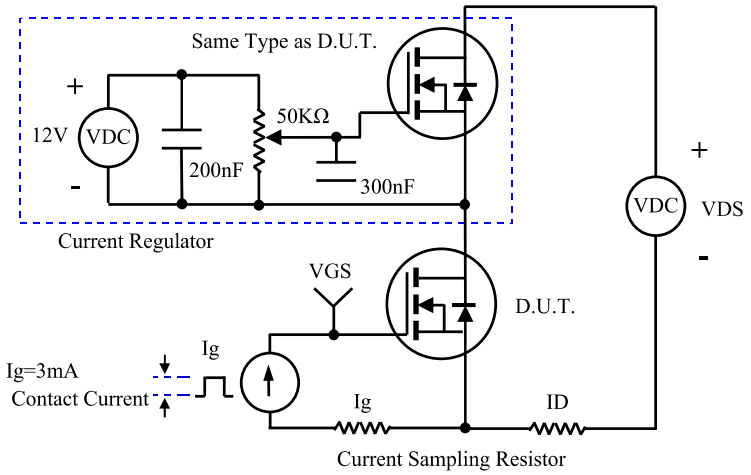
Fig.20- Inductive Switching Test Circuit & Waveform

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Test Circuit & Waveform



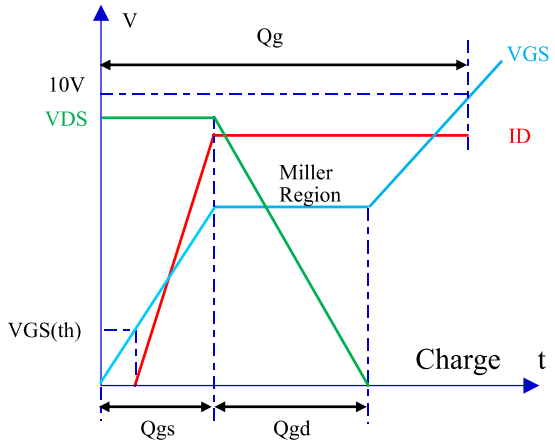
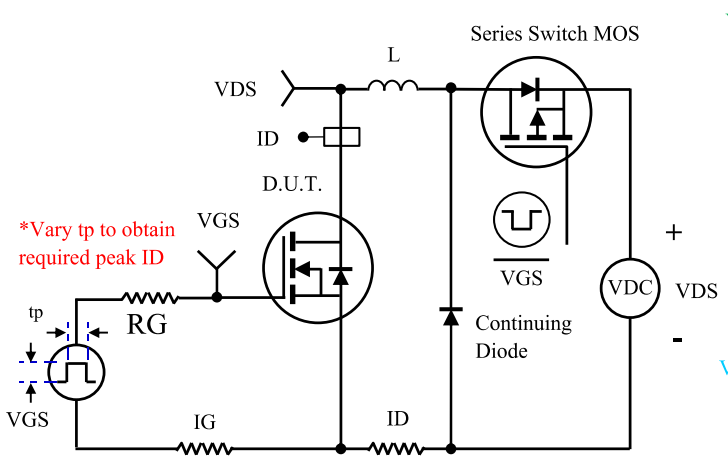


Fig.21-Gate Charge Test Circuit & Waveform



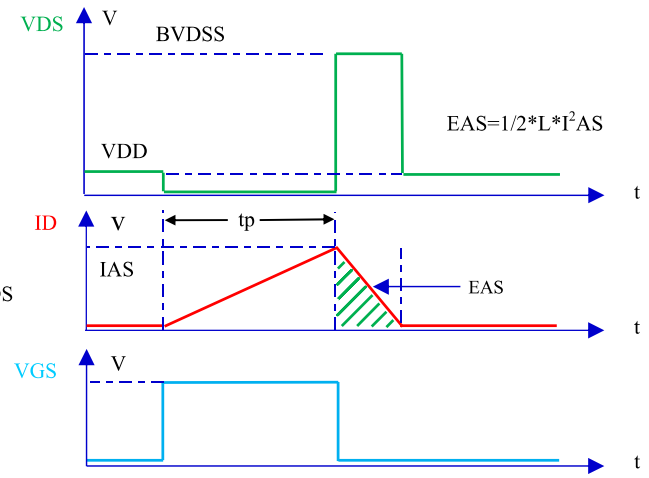
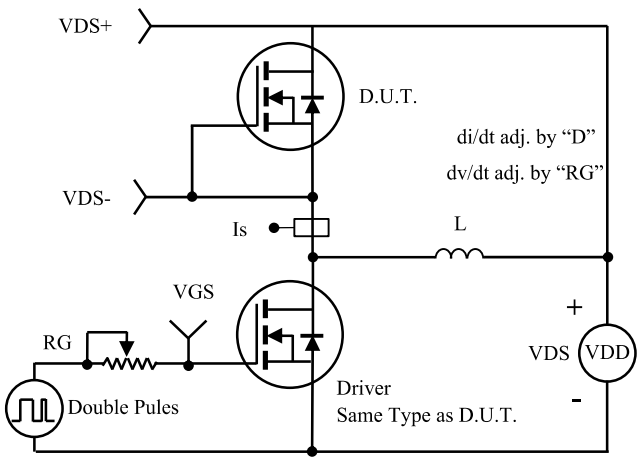


Fig.22- Unclamped Inductive Switching (UIS) Test Circuit & Waveform



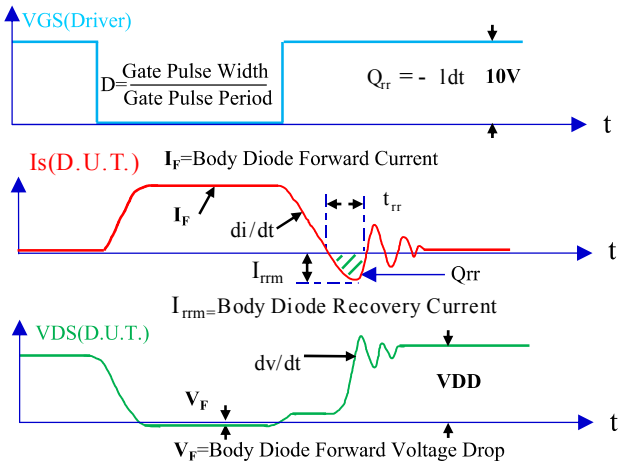


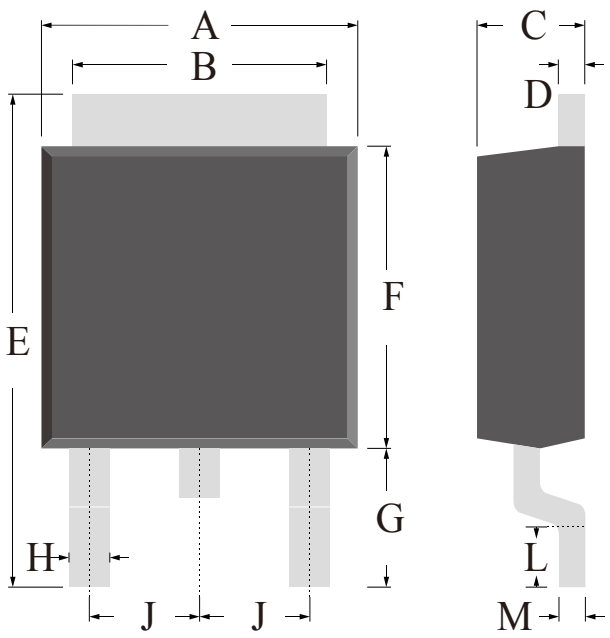
Fig.23- Diode Recovery Test Circuit & Waveform

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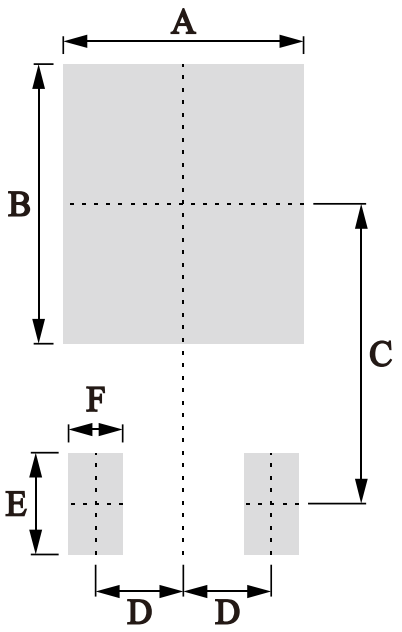
OUTLINE DRAWINGS



TO-252

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.10	-	7.10	0.2402	-	0.2795
B	4.80	-	5.80	0.1890	-	0.2283
C	1.95	-	2.55	0.0768	-	0.1004
D	0.35	-	0.75	0.0138	-	0.0295
E	9.25	-	10.75	0.3642	-	0.4232
F	5.60	-	6.60	0.2205	-	0.2598
G	2.50	-	3.10	0.0984	-	0.1220
H	0.55	-	0.85	0.0217	-	0.0335
J	2.10	-	2.50	0.0827	-	0.0984
L	1.00	-	1.40	0.0394	-	0.0551
M	0.35	-	0.75	0.0138	-	0.0295

RECOMMEDNED LAYOUT DRAWINGS



TO-252

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	6.09	-	-	0.2398	-
B	-	7.57	-	-	0.2980	-
C	-	6.64	-	-	0.2614	-
D	-	2.30	-	-	0.0906	-
E	-	2.76	-	-	0.1087	-
F	-	1.42	-	-	0.0559	-

NCH80R1K4S

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhang Trademark

FF=Product Line Code,According To Actual Changes

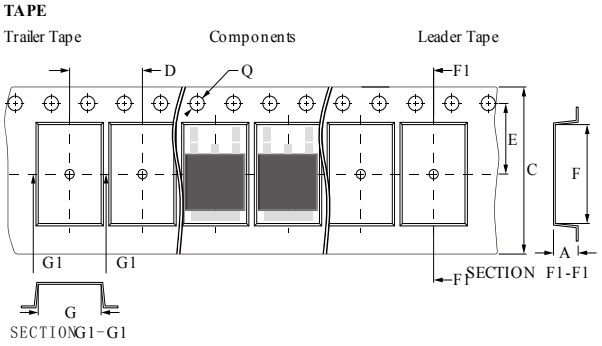
YWW=Date Code,According To Actual Changes

LLWWF=Inernal Code,According To Actual Changes

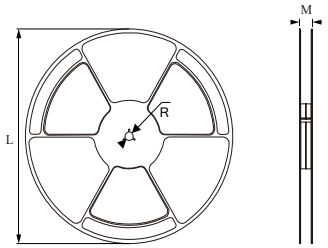
NCH80R1K4S=Model

PACKAGING

TAPE



REEL



TO-252

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
TAPE						
A	2.60	-	2.80	0.1024	-	0.1102
C	15.60	-	16.40	0.6142	-	0.6457
D	7.70	-	8.30	0.3031	-	0.3268
E	7.30	-	7.70	0.2874	-	0.3031
F	10.20	-	10.80	0.4016	-	0.4252
G	6.70	-	7.10	0.2638	-	0.2795
Q Φ	1.40	-	1.60	0.0551	-	0.0630
REEL						
L	328.00	-	332.00	12.913	-	13.071
R	12.00	-	14.00	0.4724	-	0.5512
M	19.40	-	23.40	0.7638	-	0.9213

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-252	P1	0.321	13" Reel	2500	5000	30000
TO-252	P2	0.321	13" Reel	2500	2500	25000

NCH80R1K4S

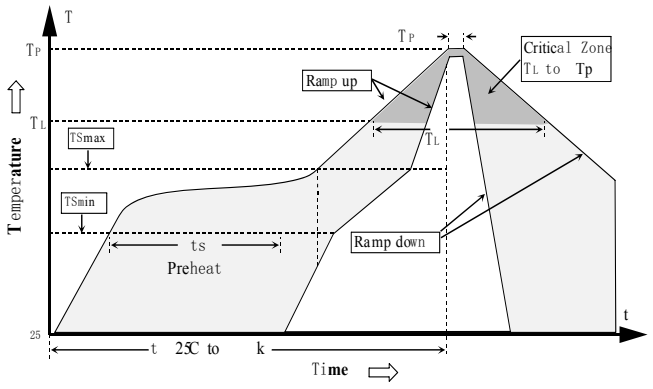
N-Channel Silicon Carbide MOSFET

Pb Pb-Free RoHS COMPLIANT

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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NCH80R1K4S

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2025-10-20	First Issue		

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