NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Voltage:	800	Volts	Current:	5.1	Amperes	Package:	TO-220FP

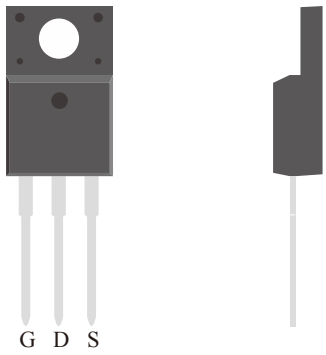
Features

- 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）

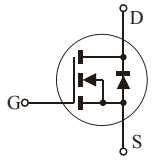
Typical Applications

- 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	5.1	**A**
RDS(ON)(TYP)@18V,Tj=25℃	480	**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		$V_{GS\ MAX.}$	-10/+22	V
		$V_{GS\ O.P.}$	0/+15	
Continuous Drain Current (Note 1)	Ta= 25 ℃	I_D	5.1	A
	Ta= 100 ℃		4.1	
Drain Current-Pulse (Note 1)	T_J< 175 ℃	I_{DM}	9.2	A
Maximum Power Dissipation Power	Ta= 25 ℃	P_D	28	W
Dissipation Derating Factor Above 25℃	Ta= 100 ℃		14	
Derating Factor		D_F	0.18	W/℃
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I_{AS}	6.0	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.22	L= 0.5 mH IAS= 6.0 A,RG= 10.0 Ω Starting Tj=25 ℃,VG = 18.0 V	E_{AS}	9	mJ

Thermal Characteristcs (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Junction Temperature		T_J	-55 to 175	℃
Storage Temperature Range		T_{STD}	-55 to 175	℃
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 75mm x 45mm x 2.5mm Alu. Heat.	$R_{\theta JC}$	5.44	

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

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb Pb-Free RoHS COMPLIANT

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}	--	0.1	50	uA
	VDS= 800 V,VGS=0V,Tj=175℃			--	1	--	
Gate To Source Leakage Current	VGS= 22.0 V,VDS=0V		I_{GSS}	--	--	250	nA
Source To Gate Leakage Current	VGS= -10.0 V,VDS=0V		I_{SGS}	--	--	250	nA
Forward Transconductance	ID= 2.5 A,VDS= 20 V		gfs	--	2	--	S
Static On Characteristics							
Gate Threshold Voltage	VGS= VDS, ID=10mA ,Tj=25℃		$V_{GS(TH)}$	3	3.5	5	V
	VGS= VDS, ID=10mA ,Tj=175℃			--	2.5	--	
Drain-Source On Resistance	ID= 2.5 A,VGS= 18.0 V,Tj=25℃		$R_{DS(ON)}$	--	480	650	mΩ
	ID= 2.5 A,VGS= 18.0 V,Tj=175℃			--	670	850	
	ID= 2.5 A,VGS= 15.0 V,Tj=25℃			--	624	950	
	ID= 2.5 A,VGS= 15.0 V,Tj=175℃			--	730	1050	
Dynamic Characteristics							
Gate Resistance	VGS=0V,VDS=0V,Freq.=1MHz		R_g	--	45	--	Ω
Input Capacitance	VDS= 694 V		C_{iss}	--	115	--	pF
Output Capacitance	VGS= 0 V		C_{oss}	--	9	--	pF
Reverse Transfer Capacitance	F= 1 MHZ		C_{rss}	--	1	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.20)							
Turn-On Delay Time	VDS= 500.0 V ID= 2.5 A	Tj=25℃	$t_{d(on)}$	--	13	--	ns
		Tj=175℃		--	11.5	--	
Turn-On Rise Time	VGS= 0/+15 V RG= 15.0 Ω	Tj=25℃	t_r	--	13	--	ns
		Tj=175℃		--	12	--	
Turn-Off Delay Time	L= 4 mH	Tj=25℃	$t_{d(off)}$	--	16	--	ns
		Tj=175℃		--	20	--	
Turn-Off Rise Time		Tj=25℃	t_f	--	29.5	--	ns
		Tj=175℃		--	28	--	
Turn−On Switching Loss		Tj=25℃	E_{on}	--	36	--	μJ
		Tj=175℃		--	40	--	
Turn−Off Switching Loss		Tj=25℃	E_{off}	--	4	--	μJ
		Tj=175℃		--	5	--	
Total Switiching Energy		Tj=25℃	E_{tot}	--	40	--	μJ
		Tj=175℃		--	45	--	

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb Pb-Free RoHS COMPLIANT

Electrical Characteristcs (Ta=25℃ Unless Otherwise Specified)

Parameter	Test Conditions		Symbol	Min.	Typ.	Max.	Unit
Gate Charge Paramters (Test Circuit & Waveform See Fig.21)							
Total Gate Charge	VDS= 500 V		Q_g	--	7.5	--	nC
Gate-Source Charge	VGS= 0/+15 V		Q_{gs}	--	2.5	--	nC
Gate-Drain Charge	ID= 2.5 A		Q_{gd}	--	1.5	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.23)							
Max. Diode Forward Current	Tj= 25 ℃		I_S	--	--	5.1	A
tp Limited by T_J(max)	Tj= 100 ℃			--	--	4.1	
Max. Pulsed Forward Current			I_{SM}	--	--	10.2	A
Diode Forward Voltage	ID= 1.2 A,VGS=-0V	Tj=25℃	V_{SD}	--	3.5	--	V
		Tj=175℃		--	3.0	--	
Reverse Recovery Time	IS= 2.5 A di/dt= 1100 A/us	Tj=25℃	t_{rr}	--	6.5	--	ns
		Tj=175℃		--	7.0	--	
Reverse Recovery Charge	VGS= 0.0 V VDS= 500 V	Tj=25℃	Q_{rr}	--	17.5	--	nC
		Tj=175℃		--	19.0	--	
Reverse Recovery Current		Tj=25℃	I_{rrm}	--	4.5	--	A
		Tj=175℃		--	5.0	--	
Reverse Recovery Energy		Tj=25℃	E_{rr}	--	0.2	--	µJ
		Tj=175℃		--	0.3	--	

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb Pb-Free RoHS COMPLIANT

Typical Characteristics Curves

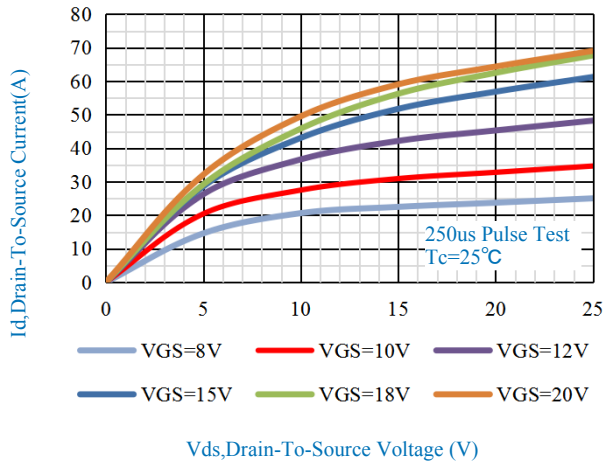


Fig.1-Output Characteristic@Tj=25℃

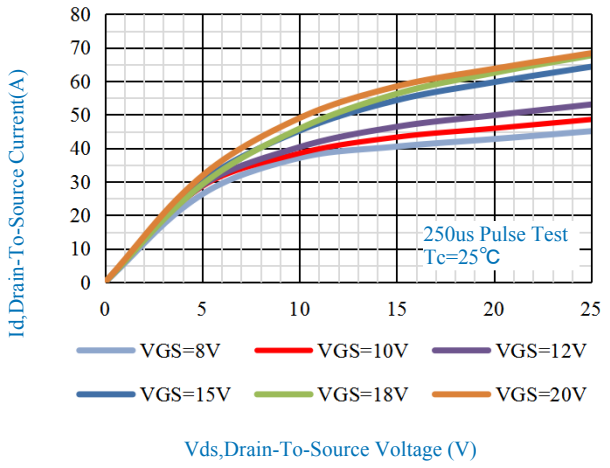


Fig.2-Output Characteristic@Tj=175℃

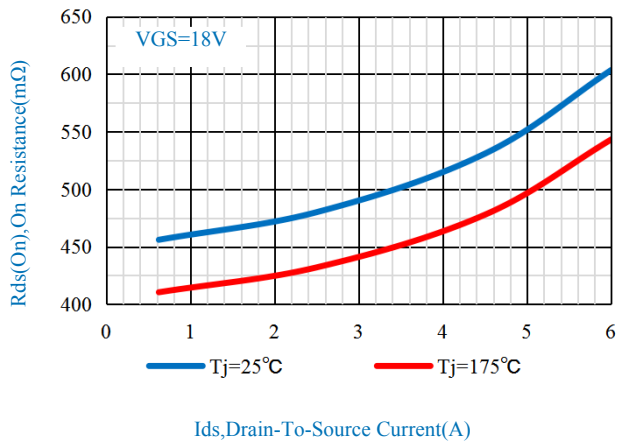


Fig.3-On Resistance Vs. Drain Current

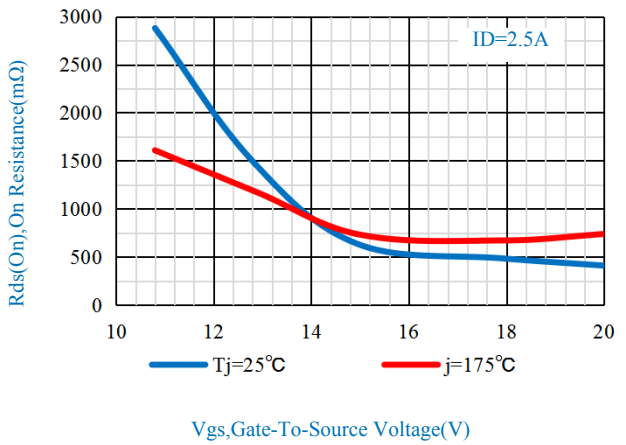


Fig.4-On Resistance Vs. Gate Source Voltage

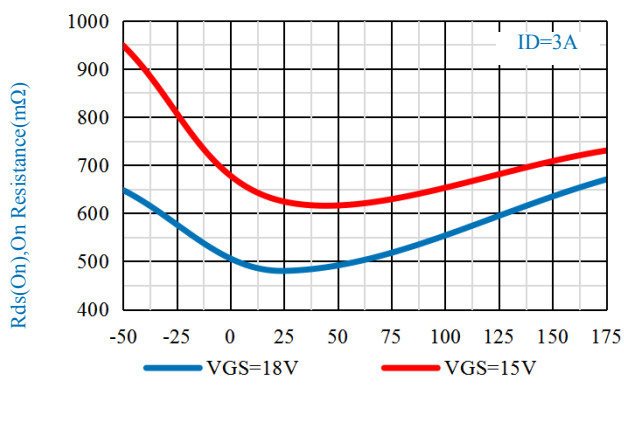


Fig.5-On Resistance Vs. Junction Temperature

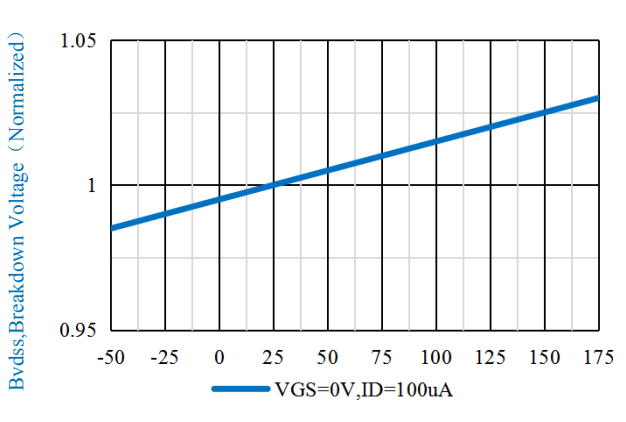


Fig.6-Breakdown Voltage Vs. Junction Temperature

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Typical Characteristics Curves

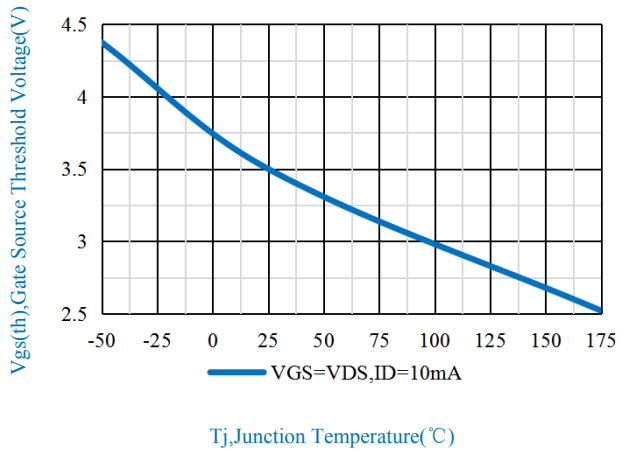


Fig.7-Gate Source Threshold Voltage Vs. Junction Temperature

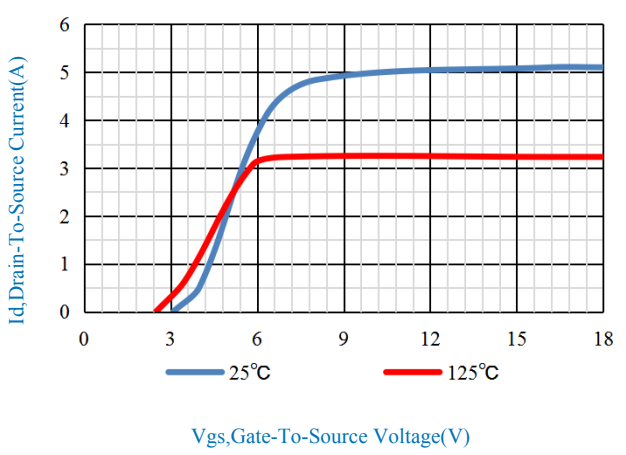


Fig.8-Transfer Characteristic

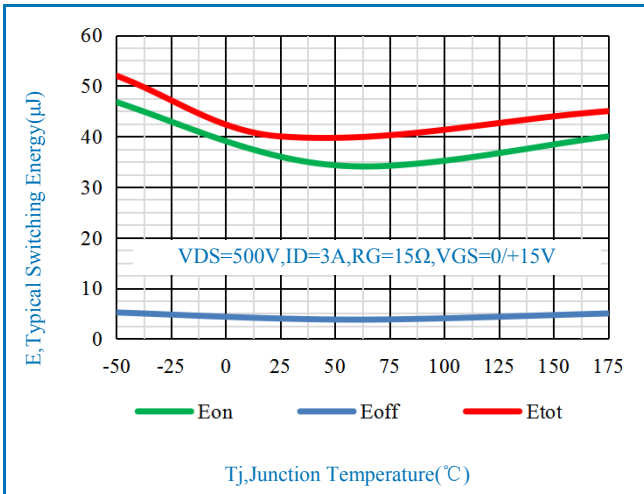


Fig.9-Typical Switching Energy Vs. Junction Temperature

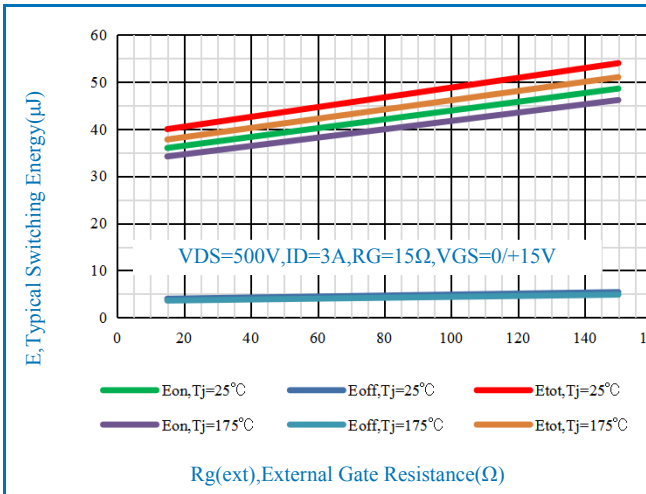


Fig.10-Typical Switching Energy Vs. External Gate Resistance

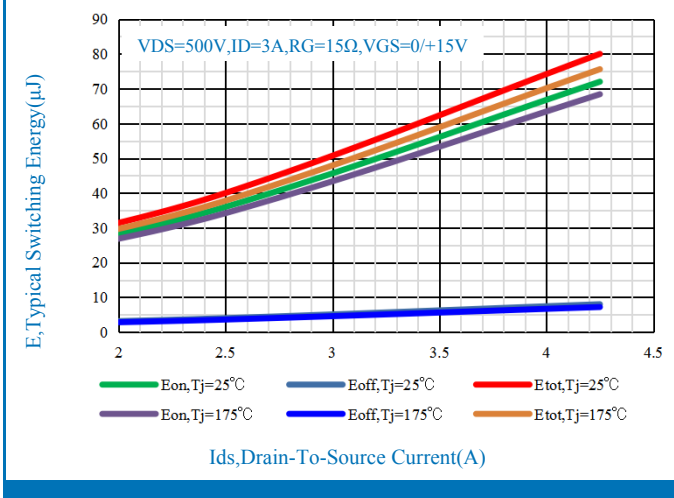


Fig.11-Typical Switching Energy Vs. Drain Source Current

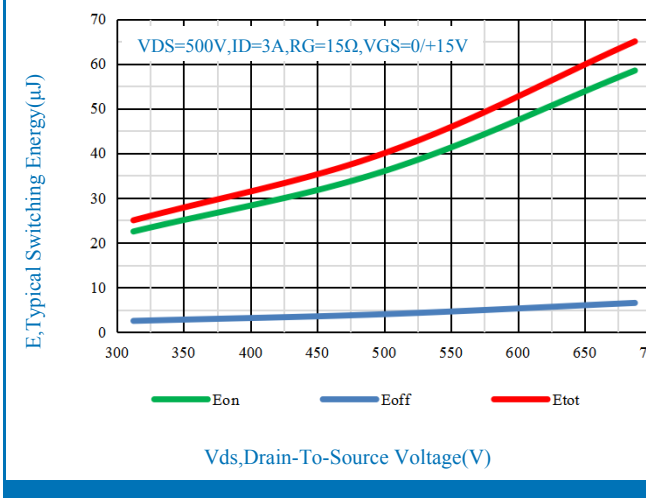


Fig.12-Typical Switching Energy Vs. Drain Source Voltage

NCK80R480F

N-Channel Silicon Carbide MOSFET

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Typical Characteristics Curves

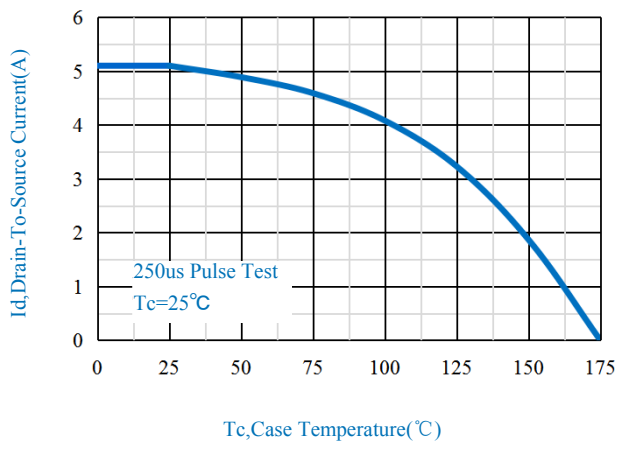


Fig.13-Maximum Continuous Drain Current Vs. Case Temperature

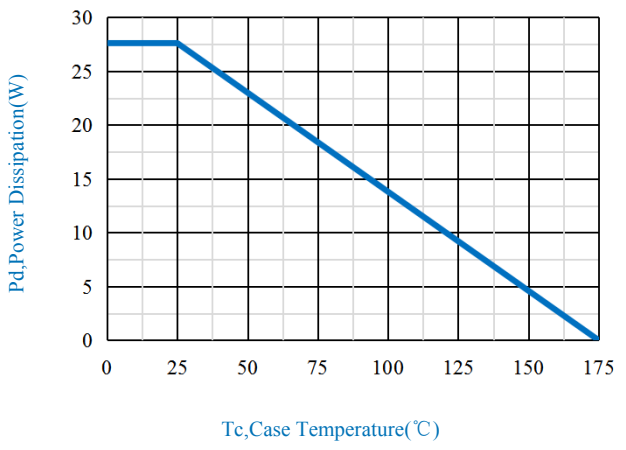


Fig.14-Maximum Power Dissipation Vs. Case Temperature

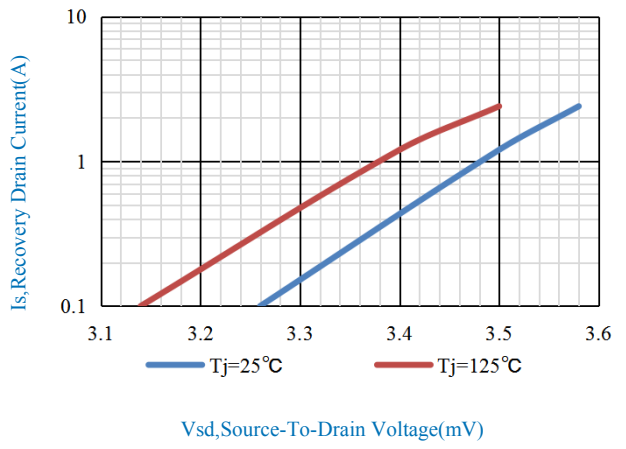


Fig.15-Source-To-Drain Diode Forward Voltage

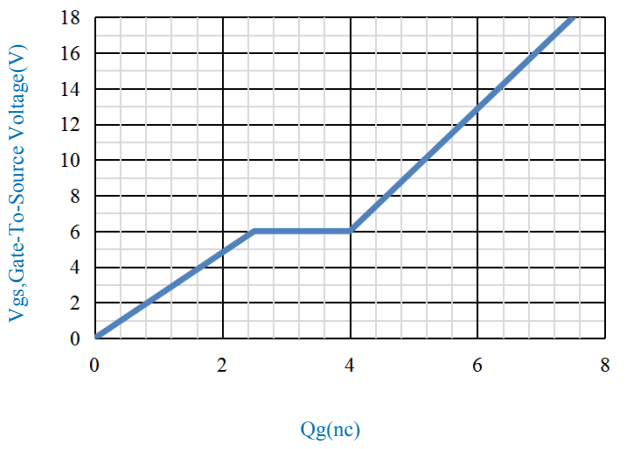


Fig.16-Gate Charge Waveform

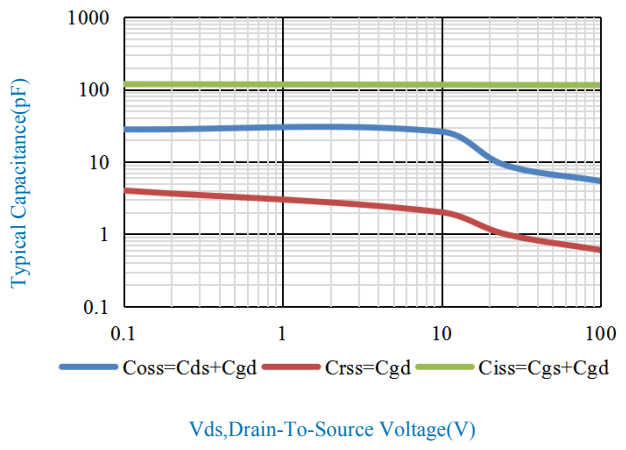


Fig.17-Typical Capacitance Vs. Drain-To-Source Voltage

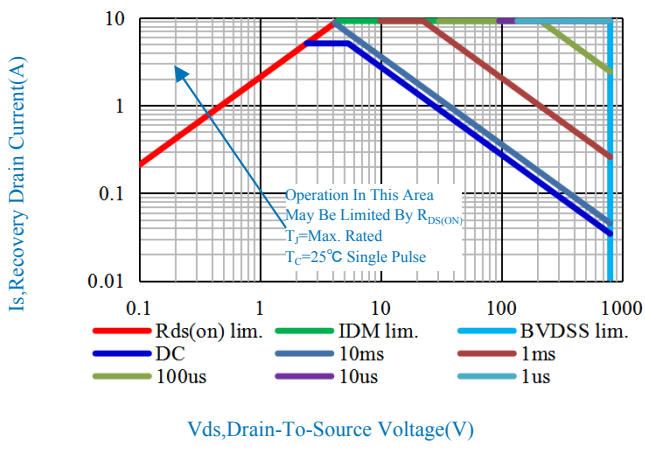


Fig.18-Maximum Safe Operating Area(SOA)

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Typical Characteristics Curves

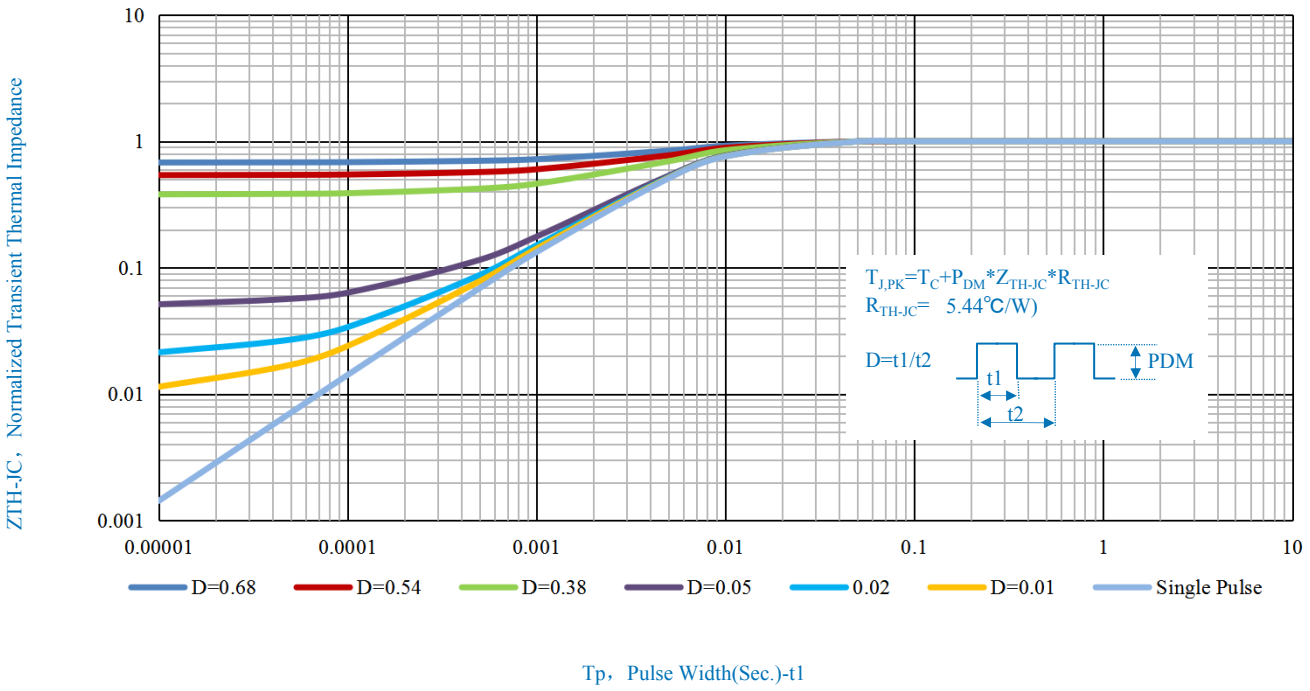


Fig.19- Normalized Maximum Transient Thermal Impedance Vs.Pulse Width

Test Circuit & Waveform

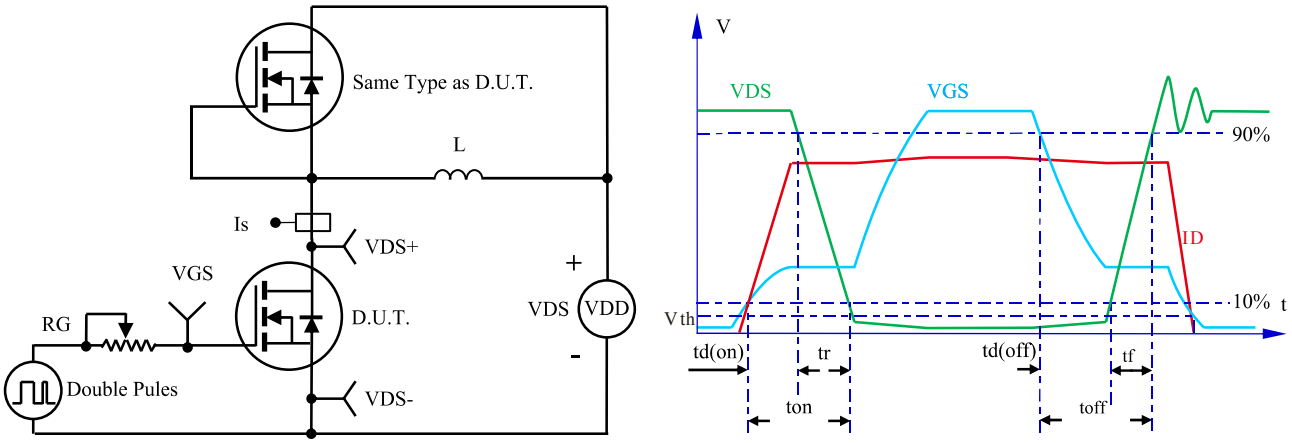


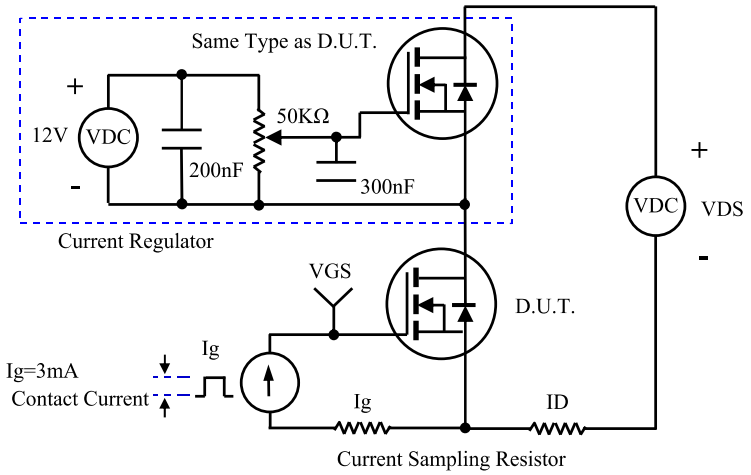
Fig.20- Inductive Switching Test Circuit & Waveform

NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

Test Circuit & Waveform



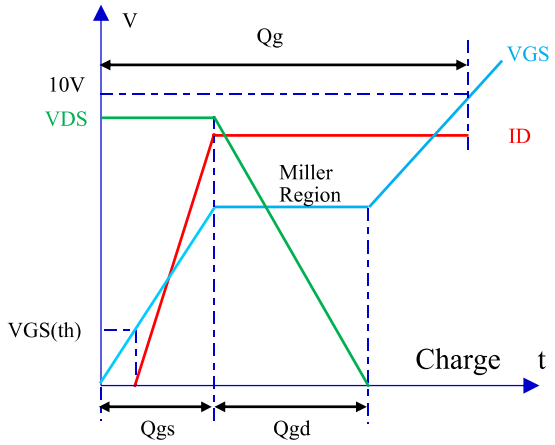
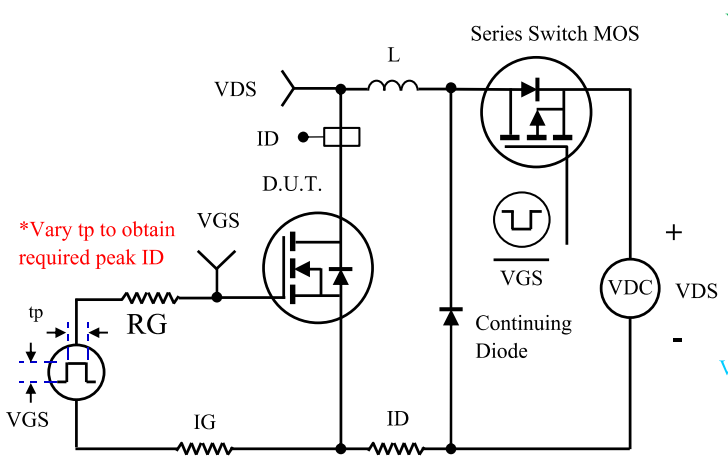


Fig.21-Gate Charge Test Circuit & Waveform



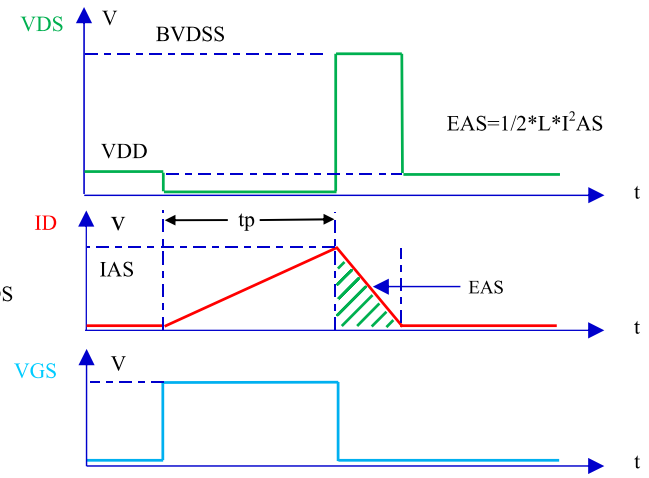
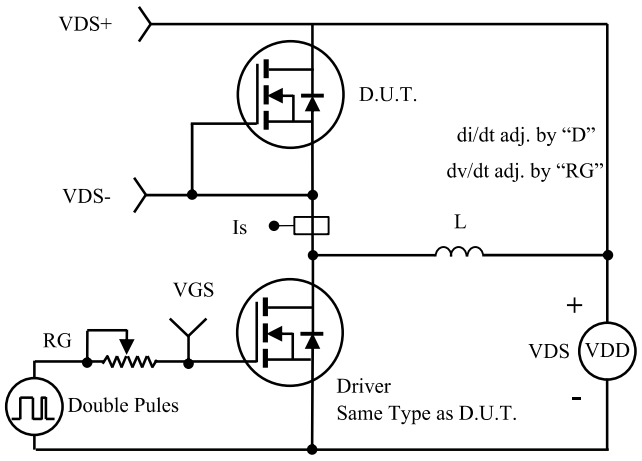


Fig.22- Unclamped Inductive Switching (UIS) Test Circuit & Waveform



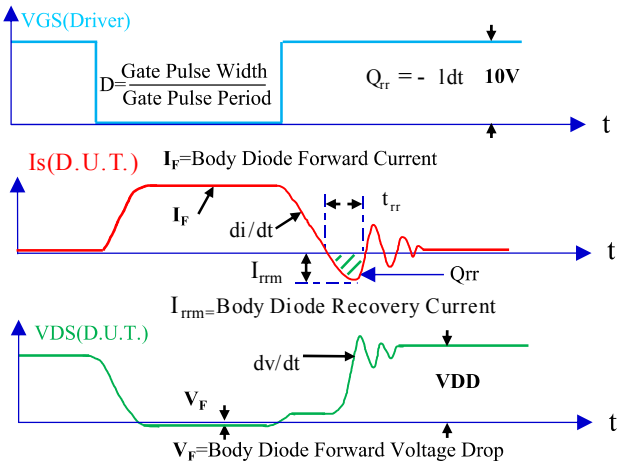


Fig.23- Diode Recovery Test Circuit & Waveform

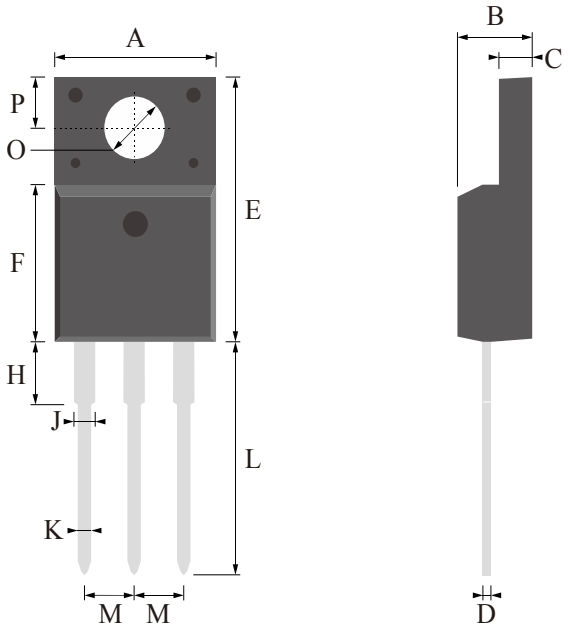
NCK80R480F

N-Channel Silicon Carbide MOSFET

Pb-Free RoHS COMPLIANT

OUTLINE DRAWINGS

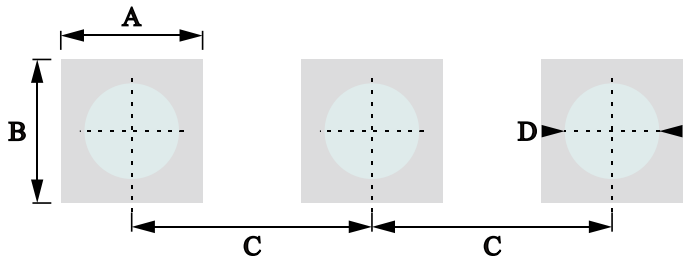
TO-220FP



OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.25	-	10.75	0.3642	-	0.4232
B	4.20	-	5.20	0.1654	-	0.2047
C	2.30	-	2.90	0.0906	-	0.1142
D	0.35	-	0.75	0.0138	-	0.0295
E	14.80	-	16.80	0.5827	-	0.6614
F	8.25	-	9.75	0.3248	-	0.3839
L	12.15	-	14.15	0.4783	-	0.5571
H	2.60	-	3.80	0.1024	-	0.1496
J	1.10	-	1.60	0.0433	-	0.0630
K	0.60	-	1.00	0.0236	-	0.0394
M	2.20	-	3.00	0.0866	-	0.1181
O	2.70	-	3.50	0.1063	-	0.1378
P	3.10	-	3.80	0.1220	-	0.1496

RECOMMEDNED LAYOUT DRAWINGS

TO-220FP



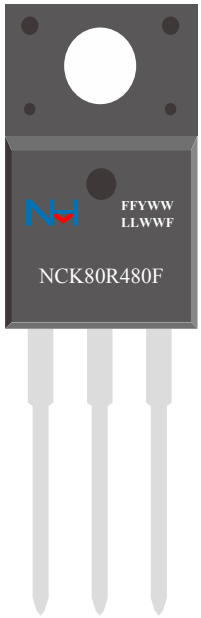
OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	1.60	-	-	0.0630	-
B	-	1.60	-	-	0.0630	-
C	-	2.54	-	-	0.1000	-
D	-	1.00	-	-	0.0394	-

NCK80R480F

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

NCK80R480F=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-220FP	P1	2.048	Tube	50	1000	5000

NCK80R480F

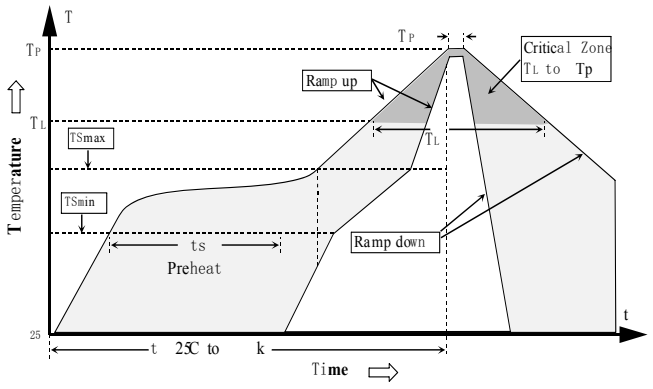
N-Channel Silicon Carbide MOSFET

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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NCK80R480F

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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