



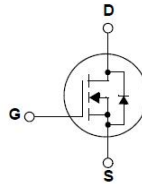
## N-channel Power MOSFET

## PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	550	
$R_{DS(on)}$ typ. at 25 °C ( $\Omega$ )	$V_{GS}=10V$	0.64
$Q_g$ max. (nC)	31.5	
$Q_{gs}$ (nC)	12	
$Q_{gd}$ (nC)	6.5	
Configuration	single	

## Features

- $I_D$  9 A ( $V_{GS}=10V$ )
- Ultra Low Gate Charge
- Improved dv/dt Capability
- 100% Avalanche Tested
- ROHS compliant



## Applications

- Switching Mode Power Supplies (SMPS)
- Power Factor Correction (PFC)
- Uninterruptible Power Supply (UPS)
- LED Lighting
- Notebook and Desktop

## ORDERING INFORMATION

Device	SPC9N50G
Device Package	TO-220F
Marking	9N50G

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Limit			Unit
		SPC9N50G			
Drain to Source Voltage	$V_{DSS}$	500			V
Continuous Drain Current (@ $T_C=25^\circ\text{C}$ )	$I_D$	9			A
Continuous Drain Current (@ $T_C=100^\circ\text{C}$ )		4.5			A
Drain current pulsed (note 1)	$I_{DM}$	32			A
Gate to Source Voltage	$V_{GS}$	30			V
Single pulsed Avalanche Energy (note 2)	$E_{AS}$	285			mJ
Peak diode Recovery dv/dt (note 3)	dv/dt	4.5			V/ns
Total power dissipation (@ $T_C=25^\circ\text{C}$ )	$P_D$	36	122	122	
Derating Factor above 25°C		0.28	1.33	1.28	
Operating Junction Temperature & Storage Temperature	$T_{STG}, T_J$	-55 to + 150			°C
Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	$T_L$	300			°C

## Notes

1. Repetitive rating : pulse width limited by junction temperature.
2.  $L = 15\text{mH}$ ,  $I_{AS} = 8\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 8\text{A}$ ,  $di/dt = 100\text{A/us}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$



THERMAL CHARACTERISTICS			
Parameter	Symbol	Value	Unit
		SPC9N50G	
Thermal resistance, Junction to case	$R_{thjc}$	3.52	°C/W
Thermal resistance, Junction to ambient	$R_{thja}$	62.5	°C/W

ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise specified )						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain to source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	500			V
Breakdown voltage temperature coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$		0.51		V/°C
Drain to source leakage current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$			1	$\mu A$
		$V_{DS}=400V, T_C=125^\circ\text{C}$			50	$\mu A$
Gate to source leakage current, forward	$I_{GSS}$	$V_{GS}=25V, V_{DS}=0V$			100	nA
Gate to source leakage current, reverse		$V_{GS}=-25V, V_{DS}=0V$			-100	nA
<b>On Characteristics</b>						
Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2		4	V
Drain to source on state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4.0A$		0.64	0.77	$\Omega$
Forward Transconductance	$G_{fs}$	$V_{DS}=30V, I_D=4.0A$		5.0		$\Omega$
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$		1271		pF
Output capacitance	$C_{oss}$			143		
Reverse transfer capacitance	$C_{rss}$			1		
Turn on delay time	$t_{d(on)}$	$V_{DS}=250V, I_D=8A, R_G=25\Omega$		27.5		ns
Rising time	$t_r$			25		
Turn off delay time	$t_{d(off)}$			127.5		
Fall time	$t_f$			35.5		
Total gate charge	$Q_g$	$V_{DS}=440V, V_{GS}=10V, I_D=8A$		31.5		nC
Gate-source charge	$Q_{gs}$			12		
Gate-drain charge	$Q_{gd}$			6.5		

SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous source current	$I_S$	Integral reverse p-n Junction diode in the MOSFET			8	A
Pulsed source current	$I_{SM}$				32	A
Diode forward voltage drop.	$V_{SD}$	$I_S=8A, V_{GS}=0V$			1.4	V
Reverse recovery time	$T_{rr}$	$I_S=8A, V_{GS}=0V, di/dt=100A/\mu s$		567.5		ns
Reverse recovery Charge	$Q_{rr}$				4	



Typical Characteristics

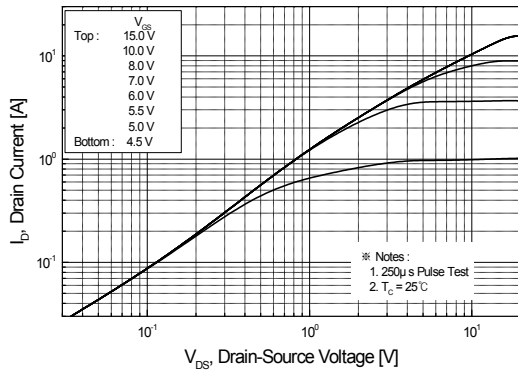


Figure 1. On-Region Characteristics

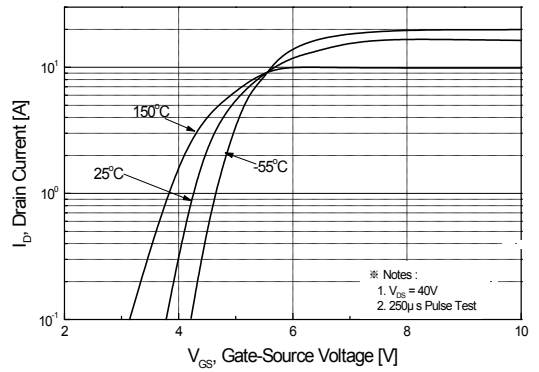


Figure 2. Transfer Characteristics

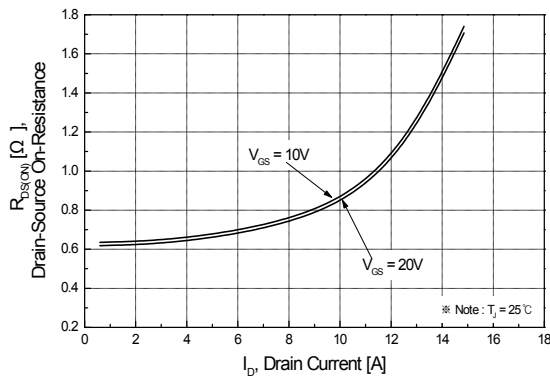


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

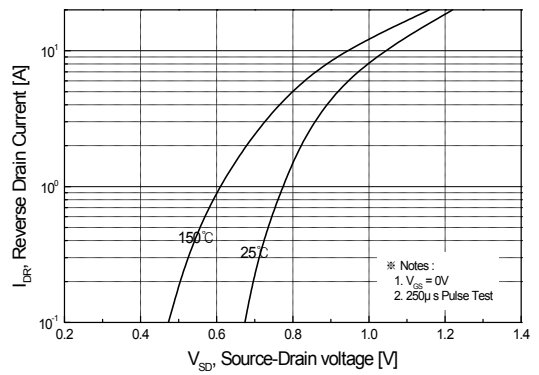


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

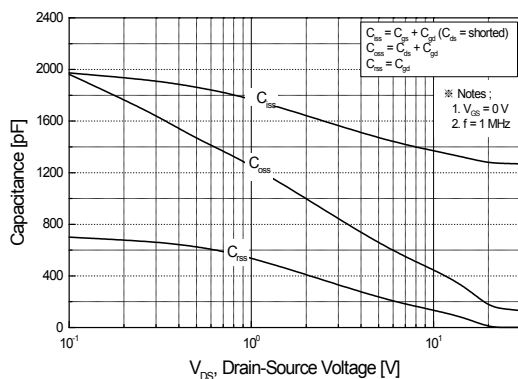


Figure 5. Capacitance Characteristics

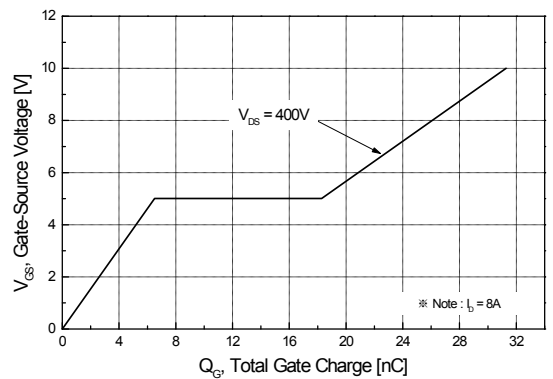


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

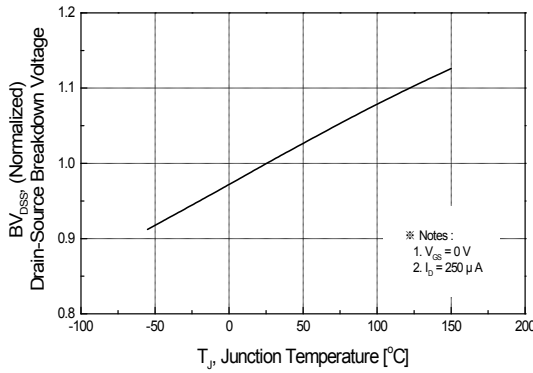


Figure 7. Breakdown Voltage Variation vs Temperature

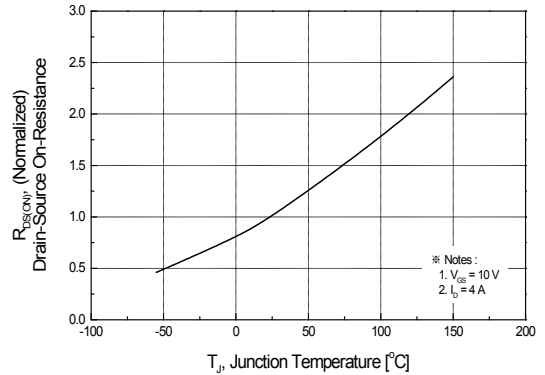


Figure 8. On-Resistance Variation vs Temperature

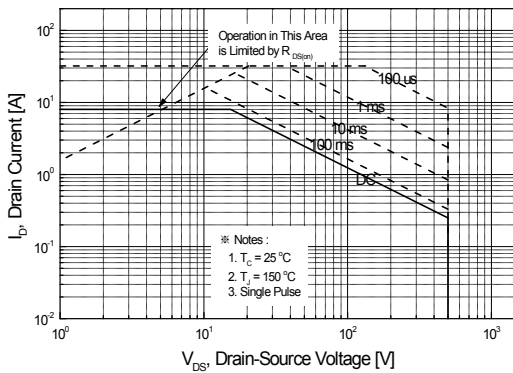


Figure 9-1. Maximum Safe Operating Area for SLP840C

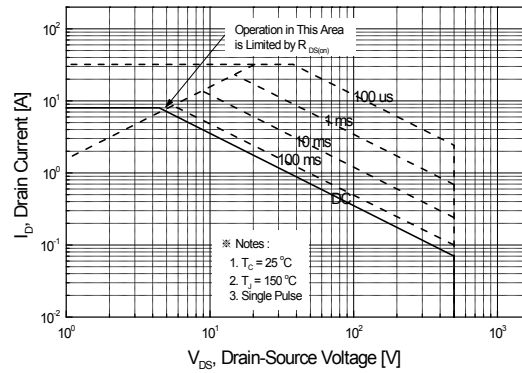


Figure 9-2. Maximum Voltage Safe Operating Area for SLF840C

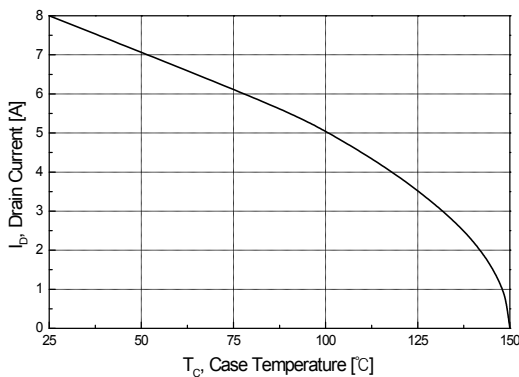


Figure 10. Maximum Drain Current vs Case Temperature

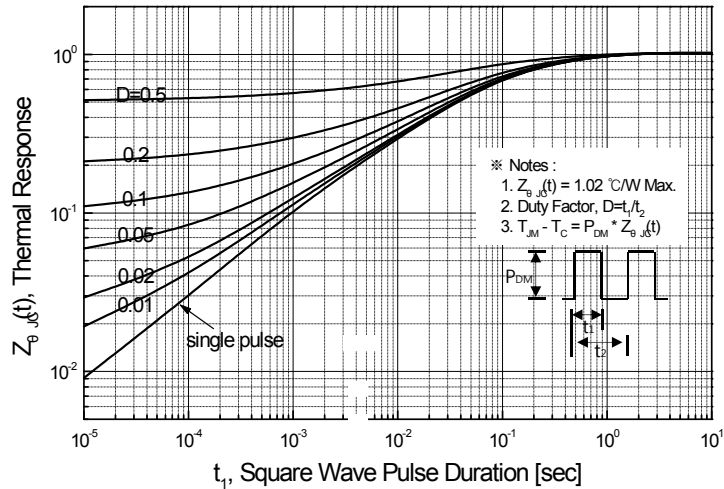


Figure 11-1. Transient Thermal Response Curve for SLP840C

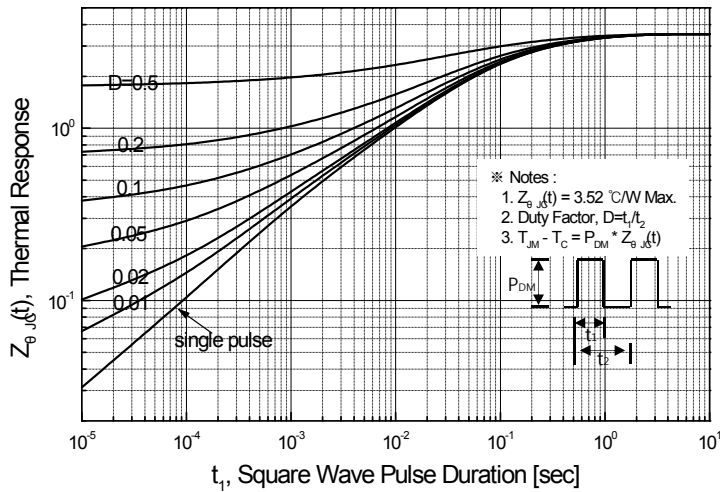


Figure 11-2. Transient Thermal Response Curve for SLF840C

### Gate Charge Test Circuit & Waveform

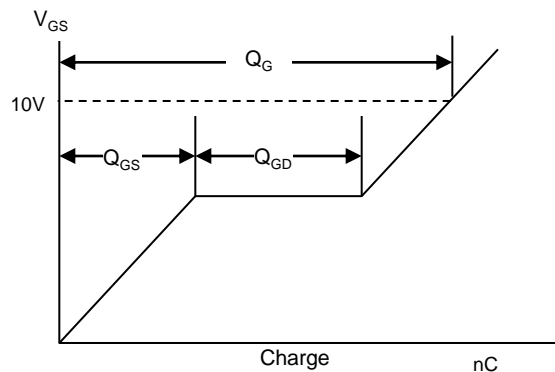
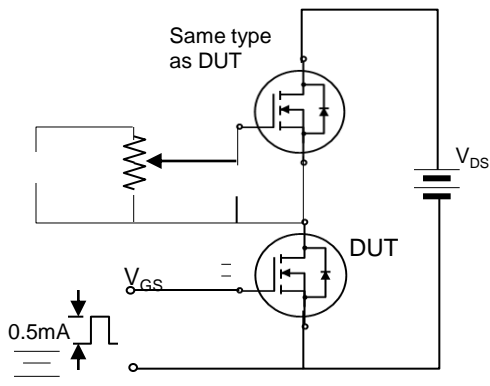


Fig 13. Switching time test circuit & waveform

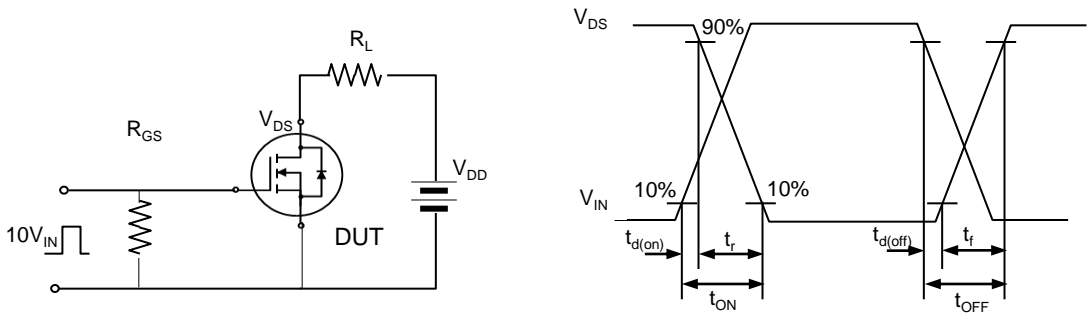


Fig 14. Unclamped Inductive switching test circuit & waveform

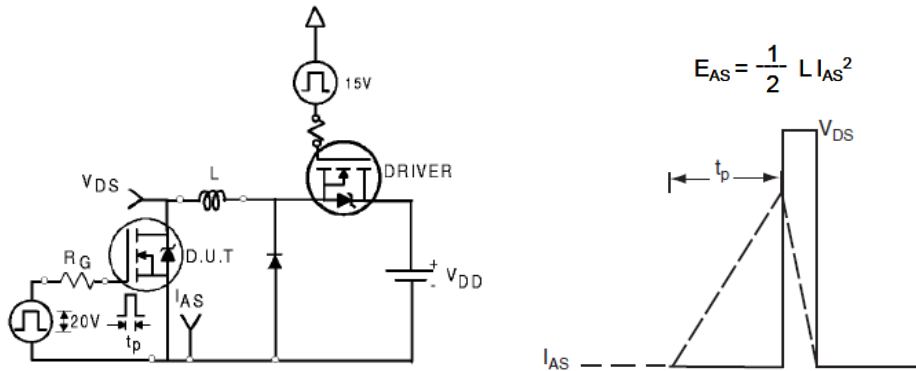
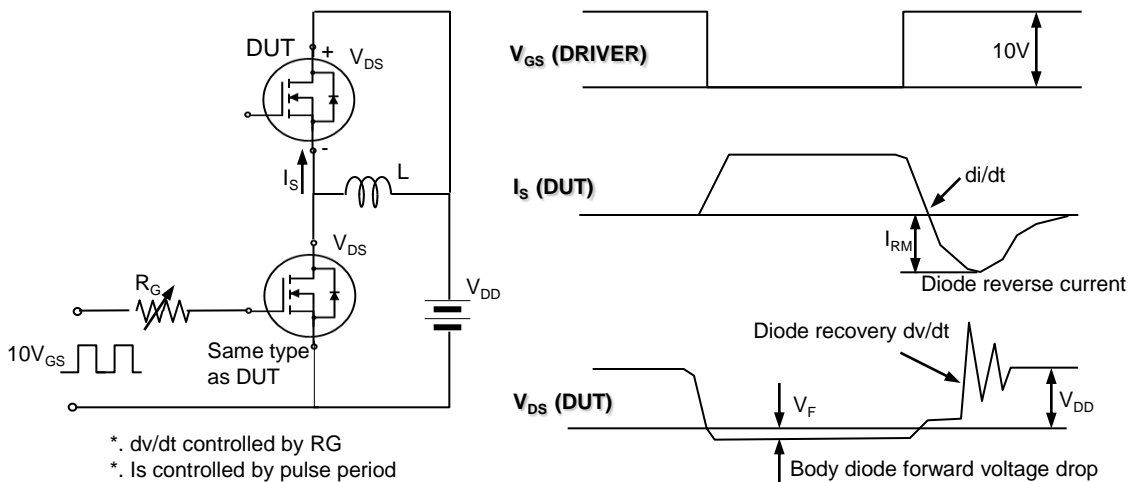


Fig 15. Peak diode recovery dv/dt test circuit & waveform





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